A SUPPLEMENT

TO THE

Practical Seamanship:

CONTAINING

I. Observations on the present *Construction of Ships*, with an Account of the Four-masted Vessel *Transit*.
II. Observations on the *Log and Line*, with a Description of various Instruments for Measuring a Ship's Way.
III. Observations on *Marine-Surveying*.
IV. On the Principles and Description of an *Optical Instrument*, applicable to the Mensuration of Distances.
V. Mode of applying the *Height of a Vessel's Mast as a Base-Line*, to determine the Distances of Objects situated within the Circle of the Sensible Horizon, as viewed from the Mast-head.
VI. Description of an *Eye-Shade*, for the Use of Weak-sighted People, who Suffer, as they Walk, from the strong Light and Heat which is reflected from a light-coloured Soil: together with an Account of a *Reading-Tube*, in lieu of Spectacles.

WITH AN

APPENDIX.

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AUTHOR OF THE
"PRACTICAL SEAMANSHIP;"
AND FORMERLY IN THE SERVICE OF THE EAST-INDIA COMPANY.

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OBSERVATIONS

ON

The Present

CONSTRUCTION OF SHIPS,

WITH AN

ACCOUNT OF THE FOUR-MASTED VESSEL

TRANSIT.

[illegible] Royal. 1830

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TRANSIT.

A MODE of rigging which has been established for a length of time, and which has required years of arduous servitude to comprehend, is naturally preserved by seamen with a regard bordering on veneration.

This circumstance, probably, has induced writers to reason on the complicated machinery of a ship more as a thing immutable, than as a matter of human contrivance, and subject to improvement.

The present manner of rigging, therefore, has remained untouched; and the only grand attempts that have been made to improve the celerity of ships, have uniformly regarded the hull. But to what purpose do we endeavour to

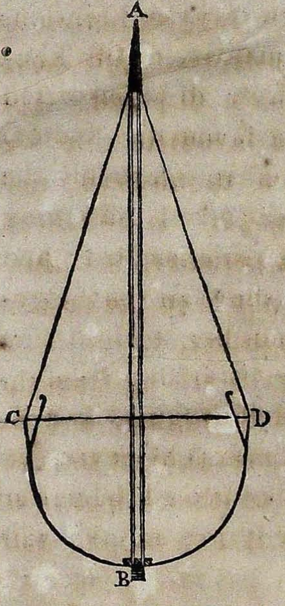
produce a body capable of celerity, if the ma-chinery by which it is to be moved cannot equally produce celerity! As well may we expect to see the lightest and best constructed carriage move swiftly with sluggish horses, as hope to see the best constructed hull move swiftly with sails improperly disposed. The seaman's partiality for his favourite ship will not unfrequently lead him to observe, that "*She will perform all but speak.*" If he reflect, however, on each day's experience, it will inform him how inadequate she is to the task he would willingly impose upon her.

Let him examine the evils arising from the immensity of her masts and rigging, and he will find her machinery is ever subject to accident, and requiring the continual labour of many seamen to preserve it in a proper state for manœuvring at sea.

In heavy gales of wind, it will frequently happen that the power of eighty hands spread upon the main-yard of a first-rate man-of-war, shall be incapable of reducing the sail attached to it; which, consequently, is left to the mercy of the element. And in various instances will the machinery of a ship defy the seaman's utmost skill and power.

This immensity of masts and rigging has also a tendency to tear the sides from the bot-

tom of the vessel; a circumstance which will be explained by the assistance of the annexed figure.



Let A B represent the mast, and AC AD the direction of the united tension of the rigging. Now, admitting the rigging to be all aloft, but not set up to the sides at C and D, then the weight alone of the whole will press upon the step at the point B, where the bottom of the vessel may be considered as sufficiently secured by the sleepers. In the largest ships, the weight of the main-mast and rigging, pressing upon the point B, cannot be less than one hundred tons. This of itself is certainly immense; but, while the rigging is slack, it has no particular tendency to distress the hull. Let us now set up the rigging, and consider the power of the united tension of all the ropes which attach to the sides of the ship at C and D: each lower shroud, and each top-mast back-stay, is drawing up the side with a tension of several tons,

and, together with the smaller ropes, may produce a tension of one hundred tons, in a direction that will tear the sides from the bottom of the vessel. Thus the total pressure on the step at B, arising from weight and tension, amounts to the enormous quantity of two hundred tons! Are we, therefore, to be surprised if the very step be crushed, and the bottom protruded at the point B? This is certainly the case: but we are precluded from observing the circumstance when the ship is afloat; and in the dry-dock, the keel is set fair by the general pressure of the vessel on a straight line of blocks.

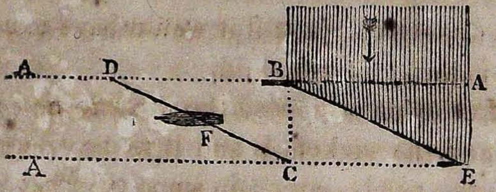
To be made acquainted with the evils arising from this immensely partial pressure, let any one go down into the hold of a ship on her return from a boisterous voyage, and he will observe the leakage which has taken place in the way of the channels, where the shrouds attach to the sides. Seamen are perfectly aware of the leaky state occasionally brought on by setting up the rigging, and thus tearing the sides from the bottom of an old and crazed vessel; a circumstance which the timbers are not calculated to prevent; for the only union between the floors, futtocks, and top-timbers of a vessel, is produced by the planking.*

* See Note A. in the Appendix.

Again, this immensity of masts and rigging, together with the structure of the hull, is a great drawback to the speed of ships, particularly with a beaming wind. Some illiterate Indians of the Southern Ocean, have clearly proved the great velocity to be obtained with a beaming wind. In Raynal's History of the Indies, Vol. III. is a curious paragraph relating to this subject. Speaking of the Marianne Islands, the Abbé observes:—"These people resided in islands separated from each other by considerable distances. Although they had neither the means, nor the desire, of making exchanges, yet they wished to communicate with each other. They succeeded in this design by the assistance of a vessel, entirely safe, though very small: a vessel fit for every naval evolution, notwithstanding the simplicity of its construction; and so easily managed, that three men were sufficient for all the manœuvres:—a vessel which received the wind sideways, a circumstance absolutely necessary in these latitudes; which had the unparalleled advantage of going and returning without ever tacking about, merely by shifting the sail:—a vessel, in a word, so expeditious, that it ran twelve or fifteen knots in less than an hour, and sometimes went *faster than the wind.*" The idea of a vessel's outstripping the very power

which drove it along, has certainly a fanciful appearance. However, when we consider that these vessels received the wind sideways, or beaming, and in consequence did not recede from its power, this seeming paradox wears a different aspect, as will be seen in the demonstration of the following problem.

Of the possibility of a Vessel's rate of sailing exceeding the Velocity of the Wind.



To elucidate this circumstance, let the dotted lines A A, A E represent two fine parallel wires, drawn horizontally, and at right angles across an opposing fluid. On these wires place the oblique plane E B, which is made to preserve its angles of obliquity, and thereby move parallel to itself, by long sockets behind it at E and B, through which the wires pass. Now, if it be admitted, that the oblique plane E B will pass sideways along the wires, from right to left, with the least possible pressure from the opposing fluid, which is running in the direc-

tion of the arrow, it will also be admitted, that while the fluid shall have passed the distance between the parallels, it will have carried the oblique plane with its sockets to the position C D. Now E C, the distance which the oblique plane has moved sideways to the driving fluid, is greater than B C, the velocity of the fluid in the same time. In this instance, the velocity of the plane and sockets so far exceeds the velocity of the driving fluid, that the friction, or resistance of the wires, might have been allowed to retard the plane one half of its motion, yet still it would have exceeded the velocity of the fluid.

Let us now suppose the wires to be removed, and the sockets E and B to be transformed into vessels, sailing in smooth water, with a beaming wind, and of so narrow a structure, as to meet only the same trifling resistance from the water, as was given by the wires in the former case. Let us also suppose the oblique plane to be converted into a sail, extending from vessel to vessel, and carried sideways by the wind. Under these circumstances, surely the same effect would be produced as in the former case! To bring the resemblance of things still nearer to practice, let us remove the former vessels, and support the oblique sail in the middle, by the vessel F; and we

shall then have a single vessel, sailing faster than the velocity of the wind which impels her along.

Such being shewn to be the case, how imperfect must the present European art of sailing appear, when it can in truth be asserted, that the finest sailing frigate will scarcely exceed one fourth the velocity of the wind! Indeed, when we view the complication of the machinery of a ship, it is natural to exclaim, "how is it possible for so heavy and perplexing a contrivance to be moved and manœuvred with ease and expedition!" with the wind on, and before the beam, each rope, mast, yard, and boom, each foot of overlapping canvass, is a drawback to its speed; and yet, of these there are abundance, so heaped together, that the machinery of a ship may be considered as the medley-composition of many minds, without regard to system.

For the purposes of navigation, a vessel should have the simplest structure of rigging: the sails should offer a flat surface to the wind; they should be of a size not exceeding the power of a few men to manage them; and they should be so placed, as not to trouble each other with back and eddy winds. The masts and rigging should also be small and light; producing thereby advantages incalculable.

Thus the vessel will be less opposed in her progress, with a beating wind; her hull will not be torn asunder by the weight and pressure of gigantic masts and rigging; and stores of every description may then be carried in the vessel, to meet existing circumstances, without crawling the globe half over under jury-masts.

The structure of the hull too requires alteration: it should be of a form admitting stability, and more suited to dividing the water; less subject to lee-way, and to rolling and tumbling about in the extraordinary manner of the present round-shaped vessels:—a shape, by the by, the least adapted to a steady and parallel motion:—and the whole should be combined to admit of greater strength, with a less expenditure of timber. A vessel, whilst on the stocks, gives the beholder an idea of amazing strength; but if the connexion of the frame be closely examined, his mind will be made sensible of its weakness. Mr. Mackonochie, in his "*Prospectus*" of a work, entitled, "*A Philosophical and Experimental Enquiry into the Laws of Resistance of Non-elastic Fluids,*" &c &c * is bold and original in his assertion on this particular. He observes, page 27, "It will be received with surprise, perhaps with contempt, by those who have been in the ha-

* Sold by Egerton, Whitehall.

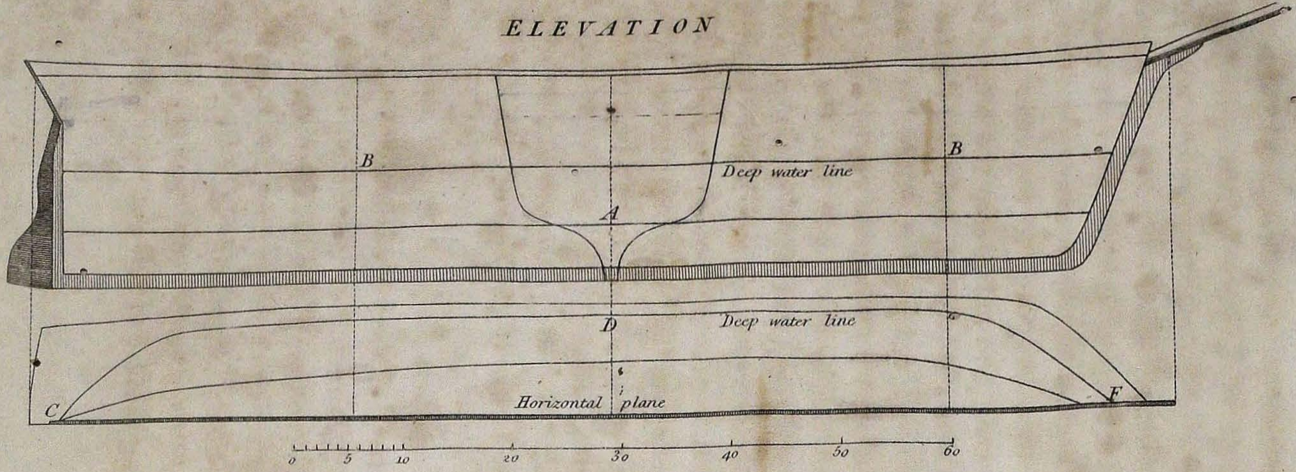
bits of viewing a ship as the noblest effort of the human genius, to hear it asserted, that in a mechanical point of view, it is the feeblest, most inartificial, and unworkmanlike structure in the whole range of mechanics." But his assertion is accompanied with proofs the most convincing, to a mind accustomed to view and to compare the strength of various combinations of timber, and does infinite credit to the ingenious author.

Taking a comparative view of the sailing of vessels, this general conclusion may be drawn: that however badly they may sail, yet all will make their passage, if you give them time, and the wind continue fair; but if the wind become foul, and blow so strong as to bring the swift and slow equally under low canvass, the proud and lofty frigate has no better chance of a quick passage than the dullest sailing merchantman; because, under these circumstances, all must inevitably go to leeward.

Since, then, it appears that all vessels are certain of making a passage, if the wind continue fair, but that none can perform it if the wind blow strong in a foul direction, surely, to construct such a vessel as will make its passage with contrary winds, is a fit subject of inquiry for the philosophic mind, and worthy the patronage of a great maritime nation!

Plate 1.

ELEVATION



Scale of Feet

J. Lodge sculp.

All experiments that have been made on the resistance of floating bodies, universally inform us—*that we may almost double the capacity lengthwise, without meeting any sensible reduction of the velocity, although the body is continued to be drawn along by the same force.* Now, if we give to a body double the capacity in length, we shall also have *twice* the length to set canvass with a side wind, and twice the stability to bear up against the double pressure thereby produced. Of course, we shall be enabled to sail this double body with the same degree of stiffness, but with much greater speed than the body having only half its length.

With this argument forcibly in his mind, the author constructed his favourite vessel the *Transit*; an account of which may be here opportunely introduced.

Simple Outline of the Transit's Hull.

(Vide Plate I.)

A is the bend of the midship body of the vessel, which continues of nearly the same form between the dotted lines B and B. To this midship body is attached a projecting bow, and tapering stern; the whole producing a water-line, at the sailing draught, resembling the curve C D F. As the leading feature of this body has capacity

lengthwise, it consequently rests on a more superficial water than vessels of the same tonnage of the ordinary build; and as the superficial waves of the sea are ever fleeting with the wind, in proportion as it blows, it became necessary to increase the depth of the keel, that it might descend into water beneath the fleeting surface, and thus preserve the vessel from being blown so fast to leeward with a beaming wind. This depth of keel tends also materially to soften the rolling of the vessel; and as it allows the rudder to hang beneath the general spread of the bottom, the water comes to the rudder by the side of the keel unobstructed, thereby quickening the steerage of the vessel. This depth of keel is partly given by dead wood, and partly by the angular form of the bottom. In the angle of the bottom is placed the iron ballast, which thus, from its low position, materially assists in counteracting the heeling that so deep a keel must naturally produce, when the vessel is strongly pressed with a beaming wind.

Again, as *length* was the leading feature of the vessel, she became proportionally narrow; and had the body not been allowed to *fall out*, or flare, as it is sometimes called, above the water line, the vessel would have been too narrow aloft to support her masts. This falling

out of the sides preserves, moreover, the vessel dry and comfortable upon deck; for the striking sea is thereby thrown off; whereas, a *tumbling-home side* offers an inclined plane to the sea, and thus aids the water in its progress inboard.

The bow being of a projecting form, admits the meeting sea to lift the vessel, and to be thrown off instantly on either side, by its conical and flaring shape: and an advantage is derived by keeping the bow conical to the gunnel; because, as the vessel pitches, the wedge-like shape pierces the sea, and prevents so sudden a check to the head-way, as is occasioned by the deep pitching of a *bluff-bow*.

To this form of hull has been adapted a system of rigging, which comprehends all the objects set forth in the following Prospectus.

Prospectus of the Transit, *a Vessel invented, built, and commanded by the Author.*

The construction of the *Transit* is grounded on principles which admit of the following material advantages over square-rigged vessels in general, *viz.*

The being more weatherly, and thereby capable of performing a passage with contrary winds.

The requiring less weight of cordage, and

lighter masts; which are combined with such uniformity and simplicity, as to allow of considerable economy in the system of masting and rigging.

The being under greater command of her helm; less subject to stern-way; less liable, or not at all, to any material accident, when brought by the lee; and the performing every manœuvre in a superior manner.

The easy reduction of her sails, which, for the most part, being very small, are less subject to be torn in pieces by the wind.

The exceeding lightness and snugness of the rigging, which lessen its wear and tear in a material degree, and at the same time reduce the labouring and straining of the hull.

The masts not depending upon each other, or upon the bowsprit, for support; which renders the vessel less liable to be dismasted, because one may fall without injury to the rest.

The smallness of the after-masts, which will allow of *spare-masts* being taken on board; and as the masts step in trunks upon deck, they may be replaced even at sea.

The riding exceedingly light when at anchor.

The being constructed so as to admit of superior accommodations for passengers and crew; and remarkably well adapted to warfare and despatch.

An endeavour will now be made to fix several of the foregoing advantages more forcibly on the reader's mind, by placing them in a *comparative* point of view:* for instance—

In Economy:

Every owner must value the economy arising from the *light* masts, *small* ropes, and *less* proportion of *canvass* on board the Transit; as here all useless overlapping canvass and staysails are totally removed.

It would be no unjust calculation to assert, that the Transit's masts, sails, and rigging, are not more than *half* the cost of a ship's masts, sails, and rigging of equal burthen. Every seaman, too, must feel the economy and convenience, arising from the similitude in the

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*** The following is a list of the names of those gentlemen who subscribed to the building and out-fit of the Transit:

	Shares.
John Blades, esq. Managing Owner	2
Henry Cooke, esq.	2
Capt. Allen Chatfield	2
William Child, esq.	2
Rev. Thos. Foote Gower	2
John Baylis, esq.	1
Misses M. and E. Brunn	1
Capt. W. S. Clarke	1
Capt. Walker	1
William Lambert, esq.	1

shape of each mast, sail, and rigging; for here the after-masts are exactly alike, and so are the sails belonging to them; whereby the necessity of having many sorts of spars, and sails of various shapes, is avoided, at the same time that the inconvenience and occasional danger of being without a particular sail to bend, are almost totally removed. To instance further,

In Manœuvring the Vessel:

To *tack*, requires only to put the helm alee, and to brace round the head-yards, and to let-draw the head-sheets, when the vessel has payed off sufficiently to fill the head-yards on the other tack. During the time the vessel is

	Shares.
James Williamson, esq.	1
Daniel Stalker, esq.	1
Capt. Money	1
—— Badham, esq.	1
R. H. Gower, Inventor and Commander	10
Seceders	3
	32

Eight thousand pounds were subscribed towards the building, out-fit, and insurance of this experimental vessel: six thousand nine hundred of which were totally sunk to the owners.

N. B. This invention is secured by his Majesty's *Royal Letters Patent.*

in stays, she preserves her head-way, and seldom, if ever, misses staying. Her veering too is equally convenient and rapid; and when lying-to with the fore-top-sail square to the mast, she never falls off from the wind, in the manner of a ship.

The labour also which is avoided by the rigging of the Transit, is material indeed. Either in tacking or veering, she has no after-back-stays to let-go, or to set-up; no stay-sail tacks and sheets to attend to; no after-yards to brace round, or any duty to perform abaft the fore-mast, as the after-sails work of themselves: nor has she any tacks to get on board, or sheets to haul aft, which is a heavy task to be performed on ship-board. On the contrary, this vessel is ever in complete condition for tacking:—the thought being suggested, the helm may be put a-lee, without any questions as to her state of readiness to perform the manœuvre.

When the Transit is in the act of *staying*, the duty upon deck occasions so little noise, and the whole is performed with so much ease to the hull, that a person in the cabin is only made acquainted with the manœuvre by the altered motion of the vessel. How different is this to the going-about of a *ship* in a fresh of wind! where the noise of the falling

coils of rope, the swinging of the yards, the shaking of the sails, the universal cracking of the vessel, the hooping and halloing, and the running of the people in every direction, is more than sufficient to frighten the stranger, cooped up between decks, into a belief that the ship is sinking!

From the nature of the Transit's sails, she cannot be placed in *irons** by any inexperienced officer that may have charge of the deck: nor is she subject to any accident, if brought by the lee, for as the wind gets round the stern to the other side, her light after-sails gibe over, with ease to the vessel, and preserve the head-way; while, should the fore-top-sail catch aback, it but assists the helm to pay the vessel off to her proper course. On the contrary, how distressing is the situation of a *ship*, if, when sailing under a press of canvass, with a strong quartering wind, she be suddenly brought by the lee! with her sails thrown flat to the mast, and all head-way at an end, without the power of bracing about the after-yards, the ship remains a perfect log afloat, and in a state to be dismasted or over-set:—at best, she seldom recovers her proper course, without some material accident.—Again,

* Such a position of the sails as renders a ship motionless.

In the Structure of the Masts and Rigging:

The Transit's masts are supported independent of each other, and of the bowsprit; which prevents the disastrous consequence, to which a *ship* is ever liable, from the general tie and connexion between her masts and bowsprit, *viz.* of involving the ruin of one mast by the fall of another, with a total inability of manœuvring the ship. Should the Transit, by wind or shot, unfortunately lose an after-mast, it is a circumstance less material to her, since in the fall, it cannot pull down another with it; and the wreck being light, a few clasp knives would presently clear it away, and leave the vessel free to continue her manœuvres.—Then again, as the Transit's after-masts are small enough to admit of spare masts being kept on board, on the first smooth-water day a lower-mast may as readily be stepped into the trunks which receive them upon deck, as a top-mast may be raised on board a *ship*.

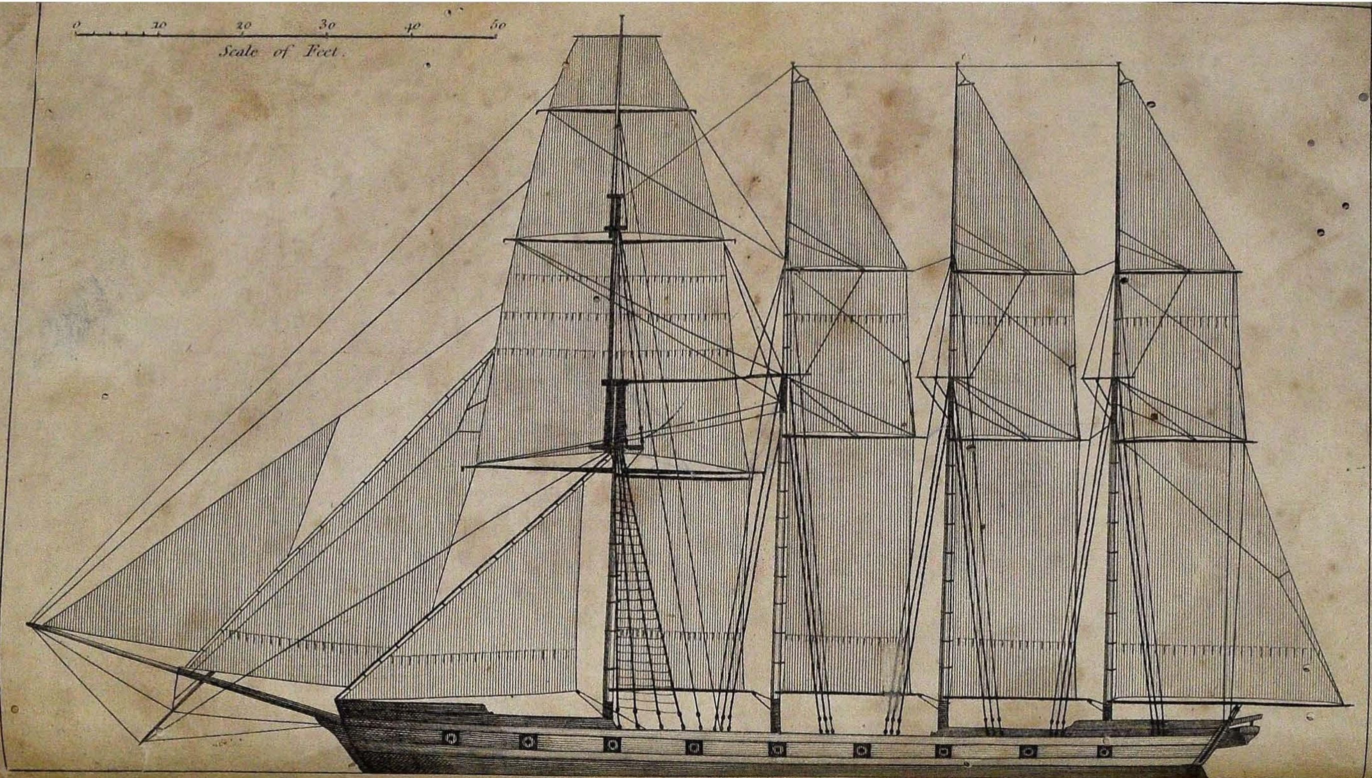
Let us now view the situation of a *ship*, when similarly circumstanced: with a lower-mast over the side, she becomes immoveable till disencumbered of the labyrinth and immensity of her wreck. This, in heavy weather, by the breaking down of the chain-plates under

the lee, is not easily performed; and the wreck may remain by the vessel for days together, at the risk of bilging the hull. The ship, too, in all probability, must be allowed to drag on a tedious voyage under jury-masts, as few ports are equal to the supply of a lower-mast of large dimensions; and those ports may be very wide of the ship's destination. To continue the comparison,

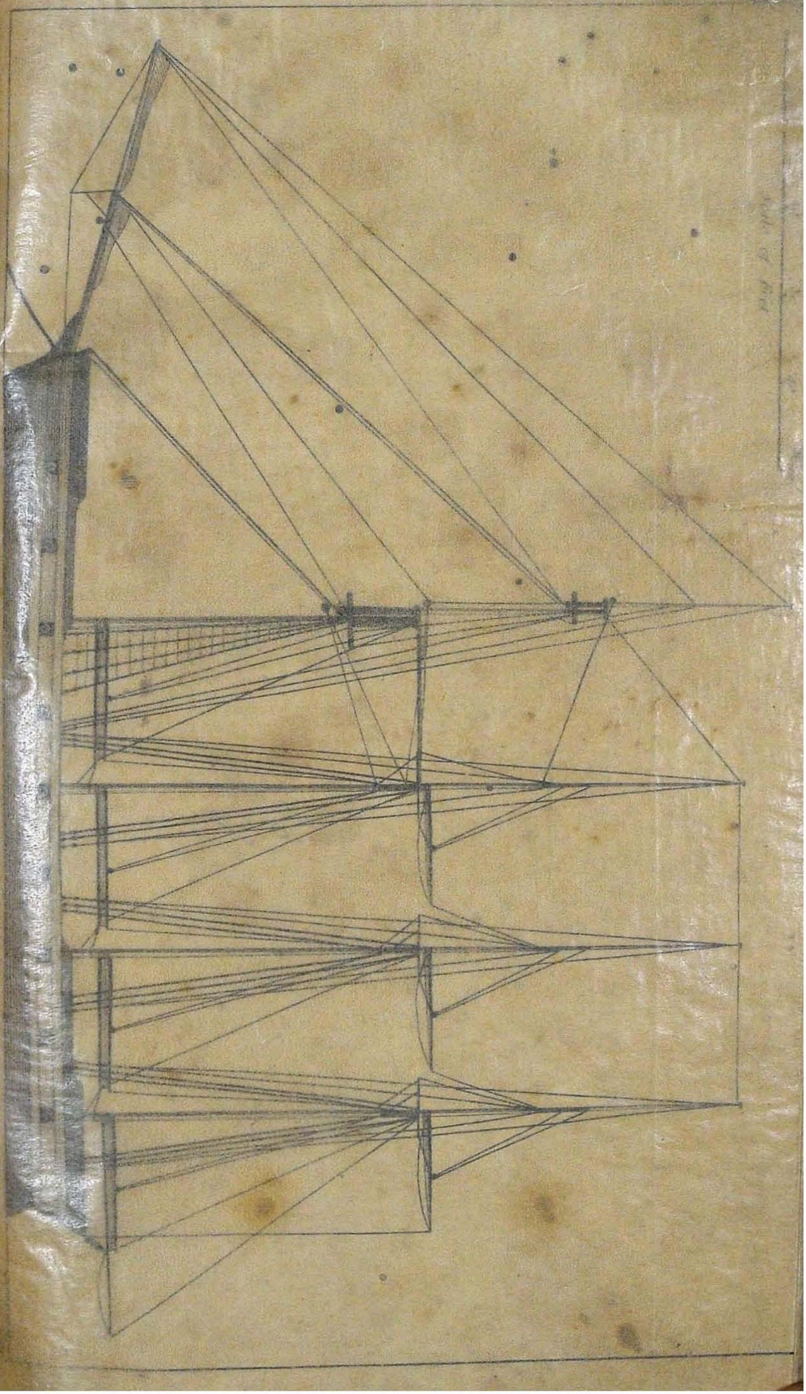
In the Anchor-geer:

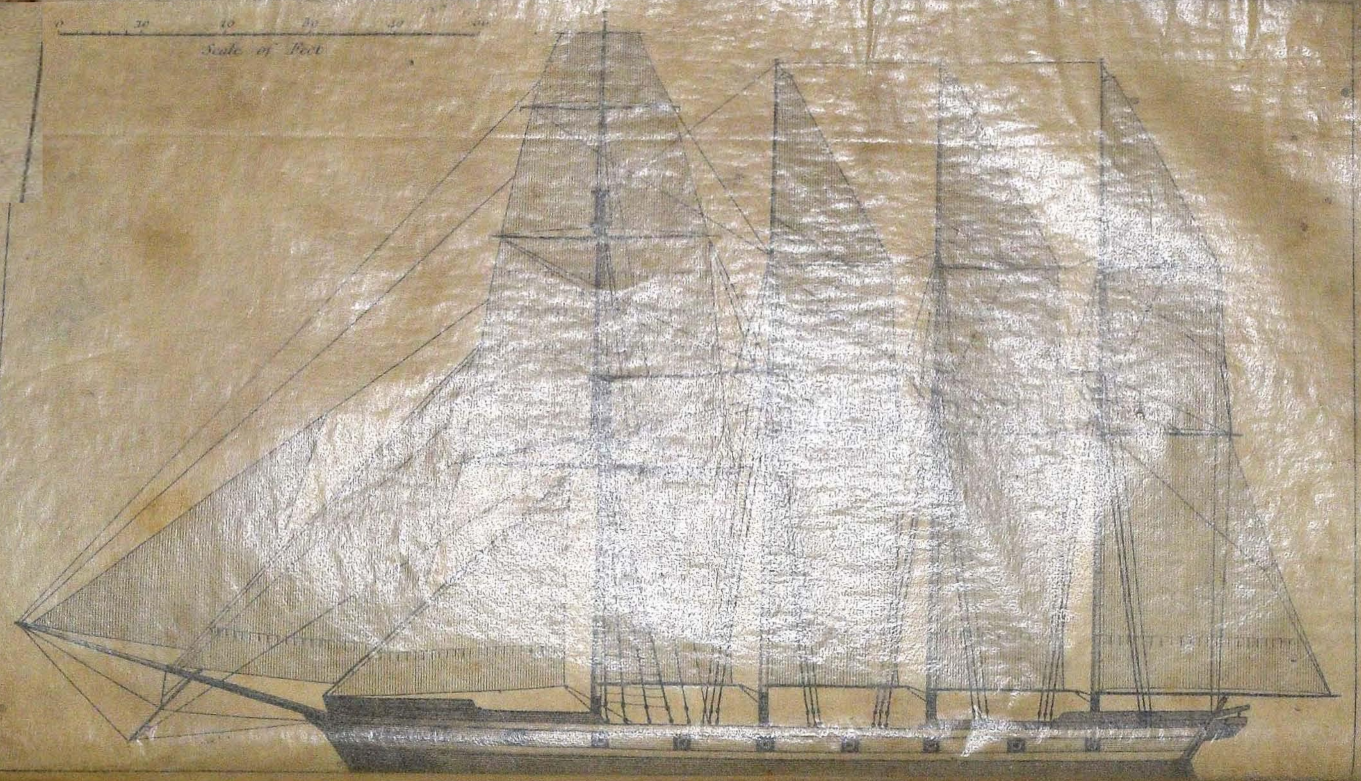
The Transit's capstern is situated before the fore-mast, thus when the cable is to be hove-in, it may be brought immediately to the capstern, and payed down the fore-hatch-way. By this contrivance, the cable is hove-in by the quick motion of a capstern, with all the simplicity of a windlass. The lumber, stoppage, and inconvenience arising from a messenger and nippers is totally removed; and the deck, during the performance of the anchor duty, remains perfectly clear, from the fore-hatch-way to the taffarel.

The manner in which the advantages set forth in the *Prospectus* have been attained, may be readily conceived by the seaman, from a strict examination of the annexed figures, the one being a representation of the Transit



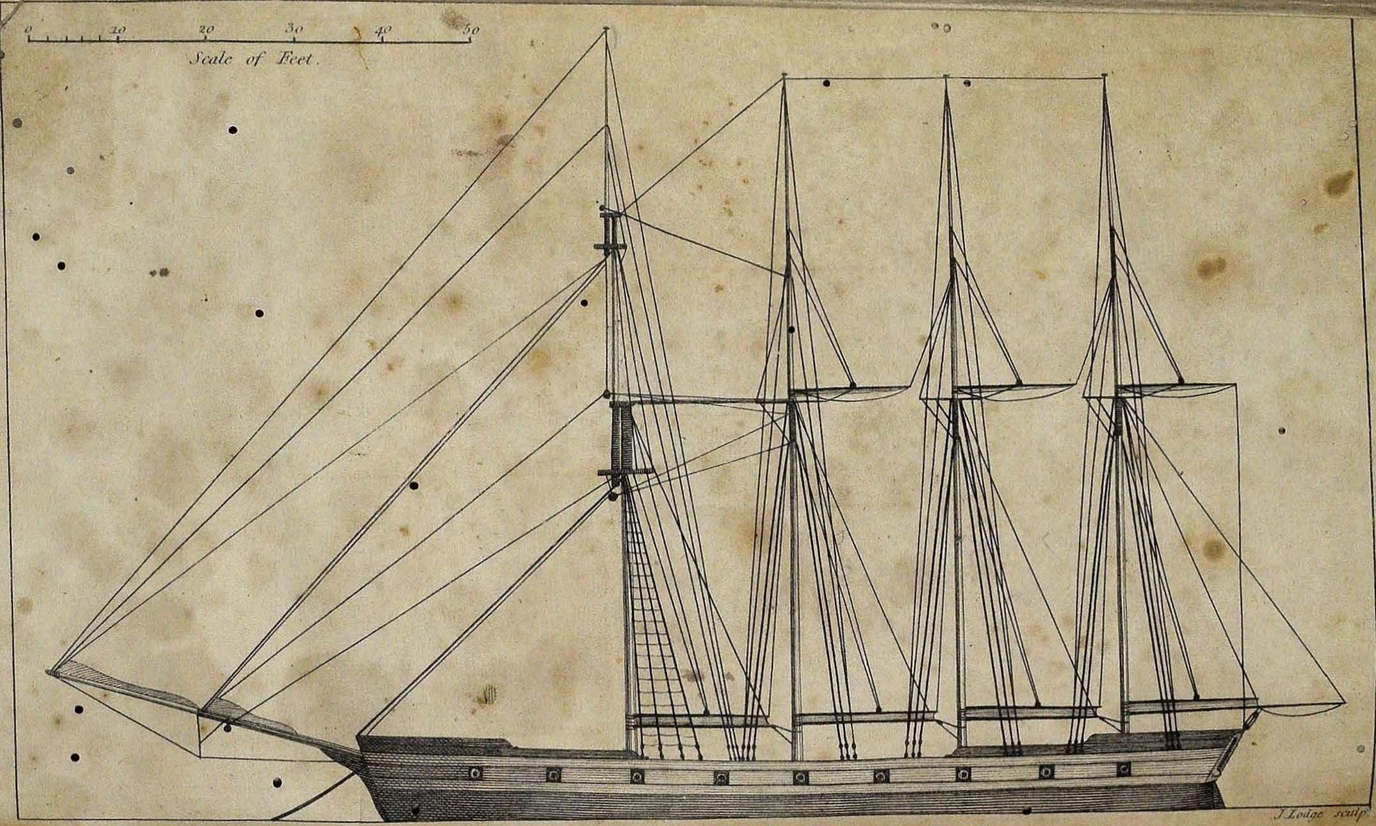
Plate





Plate

Plate 3.



J. Lodge sculp.

under full sail, upon a wind, with some improvement in the top-gallant sails; and the other at anchor, with the sails furled

As the Transit is square-rigged forward, it has been supposed by the inexperienced, that she would lay no closer to the wind than vessels which are totally square-rigged. The seaman is, however, aware, that if all the yards be equally braced-up, the head-sails will stand longer than the rest; of course then, if the Transit will bear to be conned by the head-sails braced sharp-up, she will lay closer to the wind than a ship.

The after-sails of a ship are made to touch much sooner than the head-sails, by reason of the deflected wind which is thrown back upon them from the head-sails. Thus the mizen-top-sail, by its near position, is ever made to shake by the deflected wind from the main-top-sail, if the sail be not braced-up almost fore-and-aft.

To the inventor, this plan of rigging appeared adapted to all degrees of length, without materially increasing the labour of working the vessel, for should greater length be required with the same beam, the intention is merely to add one or more masts similar to the after-masts, which will occasion but a trifling

addition to the labour, since the sails on those masts work of themselves in *going-about*.

The Transit's proportion, with respect to length and beam, rather exceeds five beams to her length, at the water-mark; which has produced so swift and easy a sea-boat, that the inventor is encouraged to believe the length might be extended without evil, and with the certain advantage of sailing faster *upon a wind.*

Having briefly stated the leading ideas which gave rise to the Transit, we shall now show, by an account of the vessel's performance under sail, how far they are supported by practice.

Brief History of the Transit.

Itchenor, in Sussex, a most retired spot, seven miles from Chichester, was suggested to the inventor as a convenient place for building his vessel. Ships had been built at the place, and there remained a mould-loft and saw-pits, in good repair. Accordingly, in July, 1799, the inventor repaired to Itchenor, and had the vessel *framed* by house-carpenters. These were discharged at the completion of their job, and shipwrights were employed to plank and finish the Transit, which was launched on the 10th of May, 1800.

After the launch, she was rigged with five masts, and soon after sailed to London, in a style which gave much satisfaction to the pilots, Messrs Norris and Hind.

Mr. Norris took charge in the Downs, and passed the vessel over the Flats, and through the Narrows, up to Gravesend, in two tides, with a beating wind; and Mr. Hind turned the vessel up the river to Blackwall, in something more than a half-tide, with a degree of pleasure bordering upon ecstasy. The inventor himself was also much gratified by the vessel's performance, although he foresaw that several evils were likely to arise, which required much of his consideration to avoid.

During the Transit's continuance at Blackwall, Mr. Pitt, Earl Spencer, First Lord of the Admiralty, and several of the then administration came there to be present at the ceremony of laying the first stone of the West-India Docks. When this ceremony had been performed, Mr. Ralph Walker, the engineer, was so kind as to call their attention to the Transit, then in one of Mr. Perry's dry docks, to be coppered and fitted up, with a view to the packet service; when the inventor had the satisfaction of conversing with Lord Spencer respecting her, in the presence of Mr. Pitt. His Lordship wished to see the vessel under

sail; and it was agreed that the Transit should be got afloat, and rigged with all possible dispatch, for his early inspection. The 9th of August was the day appointed for his Lordship to view the vessel. She sailed down to Gravesend on the previous evening, by way of practice to the people engaged to work her, who at that time were perfect strangers to her management. She returned next morning, and was boarded by his Lordship, off Blackwall, with Captain Rose, R. N.; but the wind had failed, and as it was now a perfect calm, the vessel was brought to an anchor. This unfortunate circumstance put aside the inventor's intention of manœuvring the vessel, while his Lordship was on board.

On this occasion, the inventor frankly informed Lord Spencer, that he perceived defects in his system of rigging; but he trusted that practice and more experience would teach him how to remove them. The only assistance, therefore, which the inventor required, was such employment for the vessel as would defray her expenses, with permission to sail without convoy, and in such trim as the inventor should judge proper. His Lordship fully examined the vessel, and put many questions respecting her sailing to Mr. Clippendale, the pilot; and left the inventor with the

strongest hopes of assistance, which made him joyfully meet his friends and owners on shore, who were liberally entertained at Blackwall by the managing owner, Mr. John Blades.

Two or three days after this circumstance, the inventor waited on Lord Spencer, at the Admiralty, and was sorry to find his Lordship was under the necessity of declining his services, owing to naval men not being disposed to view the Transit, at that time, in the light of an improvement; thanks, however, are not less due to his Lordship. Thus circumstanced, the improvements proceeded without assistance to the subscribers.

Having failed of meeting the wished-for employ for the Transit, and further experiment being thought necessary by the inventor, although her performance from Portsmouth to the Thames was a strong presage of her value, she was freighted for Lisbon, to defray the expenses of an experimental voyage. On the 18th of September, 1800, he set sail; and meeting with uncommonly bad weather in the channel, the inventor was made acquainted with those desiderata, which, when supplied, would render the Transit more perfect. In consequence she returned, and beating up the river against westerly winds, under charge of the

pilots Messrs. White, and Good, arrived at Blackwall on the 1st of October.

The inventor being now at liberty, he applied his mind to the improvement of his vessel, the masting of which was remodelled. In the spring of 1801, the intended alterations were put in force, which consisted in the reduction of an after-mast, and in placing the fore-mast further aft, which position admitted of its greater security, without placing its dependance on the bowsprit. When all this was completed the Transit was offered to the Post-Office, and to the East-India Company, as a fit vessel for dispatch but failing of success, she was freighted by Mr. Radimaker, the Portuguese agent, with shot and saltpetre, &c. on account of his government, and with the baggage and domestics of the ambassador, the Chavalier D'Almeida.

On the 4th of June, 1801, she sailed from the river to join convoy at Portsmouth, her crew consiting of a master, mate, boatswain, carpenter, five seamen, and four boys; in all, thirteen. While at Spithead, the Transit was frequently got under sail, by way of giving practice to the crew, in the mode of working the sails; but as she had a cargo on board, and consequently out of her best sailing trim, the

inventor was not anxious to place her against any of his Majesty's frigates, had even an opportunity offered. However, on the 29th of July, while lying in Stoke's Bay, he received information that his Majesty was about to embark on board one of the Royal Yatchs, then at anchor off Lymington, with the Hydra frigate. Considering this a fair opportunity of drawing the attention of the King to the Transit, and thereby promoting the invention, he navigated her to Lymington.

On the 30th, the King arrived. On the 2d of July, the Hydra and Royal Yatchs received orders to sail for Christchurch Bay, at which place the Royal Family were expected to embark for Weymouth. The yatchs and the frigate got under way about 3 P.M. when the Transit joined them. The wind was to the S. W. and blew a pleasant breeze. The Yatchs passed on the north side of the Shingles, thereby making a leading wind into Christchurch Bay; but the Transit was made to pass on the south side, for the purpose of trying her sailing with the Hydra, *upon a wind.* She passed the Hydra under the lee. On her arrival in the bay, she was joined by two gentlemen, who had witnessed this circumstance from Christchurch Tower, and who, from motives of curiosity, were induced to inspect the Transit. Being informed of the

cause of the inventor's trip, they earnestly advised him to wait upon Mr. George Rose immediately, as the King was expected to breakfast at his house in the morning, and then to embark for Weymouth. In consequence of this recommendation, he went on shore, and was met by the younger Mr. Rose, who politely introduced him to Sir Harry Burrard Neale, which had the appearance of being truly fortunate, as he commanded the Royal Yatch, and was much about the person of his Majesty.

Early the next morning, the King's party were observed to join at Mr. Rose's house. The wind blew off the land a pleasant top-gallant breeze, and gave the most favourable opportunity of turning the Transit to and fro, and of shewing her off to the best advantage, in front of Mr. Rose's house, while the Royal Family remained at breakfast. After the embarkation, she was sailed three times round the Royal Yatch, and drew the particular attention of the King, Queen, and Princesses. The Yatchs being now under way for Weymouth, the Transit bore up for Spithead, at 11 A. M. and anchored off Haslar Hospital, at 2 P. M. —the inventor having risked the insurance of the vessel and cargo, by this deviation from her voyage, without obtaining the object of his wishes!

A short time after the foregoing circumstance, he was called up in person, from Portsmouth to the East India House, and informed by the CHAIRMAN of an intention to befriend him, and to *purchase the* TRANSIT, *provided she proved a fast-sailing vessel.* To establish this point, Earl St. Vincent, then First Lord of the Admiralty, had agreed to order a fast-sailing government vessel to be tried against her in the Channel. It was stated by the inventor, that the Transit having a cargo on board, was by no means in the best sailing trim. In answer to this, he was informed, "*allowance would be made on that account.*" All risk occasioned to the vessel and cargo, by the intended cruise, was to be taken or covered by the owners. The stake to be run for being thus explained, Capt. Corner, the Deputy Master-Attendant of the East India Company, received orders to join the vessel, with the inventor, and to report her performance.

At the expense of the Fast India Company, they proceeded to Portsmouth in a post-chaise and four, with all possible dispatch. During their passage down, the inventor was naturally induced to reflect on the various circumstances that were likely to arise from this sudden, and unexpected, call to London. A number of images continued passing in his

mind; and amongst them the India Company made their collective appearance, in the person of their Chairman, who seemed fully bent on promoting the endeavours of a faithful servant, for the advancement of naval science, provided those endeavours met the sturdy test of full and fair experiment. Pleased with this image, the inventor, for the present, rested on his oars.

Official Test of the Transit.

The following statement, relating to the Transit's cruise with the Osprey Sloop of War, which was the government vessel appointed as her antagonist, is taken from the inventor's journal of the Transit's proceedings.

On the 11th of July, 1801, Captain Corner and myself arrived at Portsmouth: we immediately waited on Sir Charles Saxton, the Commissioner, and Admiral Milbank, the Port Admiral, to inquire if any of his Majesty's vessels were appointed to sail against the Transit. The Admiral, we were informed, had not received orders to that effect; nor was there, at that time, any vessel in a state of readiness to sail against her. Finding reason to expect some days of delay, I procured an order from the Customs to take out a part of the Transit's cargo, by way of lightening the vessel, and

thereby putting her into better sailing trim, which would consequently prove more definite and more satisfactory to all parties, than trusting to "*allowances.*"

July 13. Received information that the *Osprey* sloop of war was ordered to proceed on a cruise with the Transit, as soon as she could be got ready for sea. In the course of the day, Captains Donnelly and Dundas, of the Royal Navy, with several of the East India Company's commanders, came on board with Captain Corner, to inspect the vessel. Captain Donnelly informed me that the frigate he commanded would be ready for sea before the Osprey, and advised my applying to the Port Admiral for the *Maidstone.* In consequence, I waited upon the Port Admiral, but was informed that my request could not be granted, as the Osprey was considered the finer sailing vessel.

July 14. Employed lightening the Transit.

—— 21. Got under way, and manœuvred the vessel, between Spithead and the Isle of Wight. In the course of this day, an opportunity offered of putting the Transit against the Commissioner's Yatch, which is considered a very fast-sailing vessel. This circumstance gave me reason to be well satisfied with the trim of the Transit; for, previous to lighten-

ing the vessel, she had been put against the Commissioner's Yatch, without shewing so great a degree of superiority as in the present instance.

July 22. Received convoy instructions and signals from his Majesty's ship Osprey. In the evening, Captain Corner, and Mr. Brown, first pilot to Portsmouth harbour, came on board.

Dimensions of the Osprey.

	Feet.	Inches.
Length of Keel for Tonnage	80	6
Beam	29	11
Length of Gun-deck	102	0
Depth of Hold	12	9

Burthen, 383 tons.—Guns, 18 32-pounder carronnades. —Men, 121.—Built at Northfleet, on the plan of a French corvette, in 1798.

Officers of the Osprey.

George Irwin, esq.......... Commander.
John Eagell .... First Lieut.
Robert Henderson........... Second Lieut.
Joseph Curphy.............. Master.

July 23. At 4 A. M. got under way, with a pleasant easterly breeze. Stood out for the Port Admiral's ship, the Royal William, and received from her six seamen to assist in workin the vessel.

At 5^h the Osprey made the signal for sailing, and weighed The Osprey at this time was half a mile without us.

At 5^h 30′ the Osprey on our lee-beam, both vessels being close hauled on the larboard tack, and abreast of the Warner Buoy. Occasionally tacking, till we cleared the Ledge Buoy. When clear of the Ledge, steered close-hauled to the S. E., both vessels having all sail set. Rate of sailing about four knots.

At 7^h, the Osprey two miles astern.

At 8^h, the Osprey three miles on the lee-quarter: tacked, and bore down to hail her, as per signal.

At 9^h, hove-to, and went on board the Osprey, with Captain Corner. The weather at this time being very hazy, it was Captain Irwin's request that the Transit should be kept as close as possible to the Osprey, to prevent separation; when the Transit's advantage would be made obvious, by her comparatively small show of canvass, which would be stated in his report.

At 9^h 30′, made sail: wind S. E.: course, S. S. W.: rate of sailing 3 knots. The Osprey under all sail, even royals and flying jib, and sailing close-hauled; while the Transit kept pace, with her after-top-sails and top-gallant-

sails furled, the fore-top-gallant-sail on the cap, and the jib down.

At noon, the Osprey a cable and a half ahead. From this position, we instantly made sail, and passing to windward of the Osprey, wore short round her bow; then, passing her lee, we luffed about to our former position, under her stern, in 25 minutes. The weather now more clear.

At 1^h P. M. the Osprey half a cable ahead, and under the same sail: rate of sailing about 4 knots. From this position we passed under her lee, luffed round her bow, and dropped to our position astern, in 20 minutes. We then shortened sail to keep our station, having shown a most decided superiority over our opponent, with a pleasant breeze, and smooth water, *upon a wind*.

At 3^h, the Osprey made the signal, and bore up immediately before the wind, setting studding-sails on each side, below and aloft. The Transit followed, keeping way with the Osprey under her ordinary square-sails. During our running before the wind, we could observe the people on board the Osprey endeavouring to trim for the better, by removing her guns; but it did not appear to us to produce any good effect.

At 5^h, the Osprey took in her larboard studding-sails, and hauled the wind four points upon the starboard tack. We passed the Osprey under our ordinary sails. Having shown, by the two last manœuvres, our superior sailing over the Osprey, both *before the wind*, and with the *wind quartering*.

At 6^h P.M. the Osprey shortened sail for the night, and hauled her wind upon the larboard tack.

At 8^h, Dunnose, N.E. ½ N.; Needle's point, N. by W.—tacked; course, S.S.E. wind, E. and blowing fresh. During the night both vessels continued under easy sail; the Transit being repeatedly bore-up to preserve her station near the Osprey: rate of sailing, between 3 and 4 knots.

July 24. At 4^h A.M. wore as per signal: course, N.E. by N.—wind, E. by S. and blowing very strong.

At 6^h, the Osprey made such sail as she could prudently carry. The Transit did the same; but she was repeatedly bore-up to keep her station. As this circumstance might not be observed by the officers of the Osprey, at 9^h it was agreed that the Transit should be kept steady to the wind, by way of shewing clearly to Captain Irwin, the weatherly powers of the Transit, with a strong breeze of wind. At this

time there was much head-sea:—the Osprey was taking the spray over all, and pitching exceedingly deep, as if too much pressed with sail, while the Transit was sailing perfectly dry and easy, under her canvass:—rate of sailing about 5 knots.

At noon, the Osprey 3 miles on our lee-beam.

At 1^h P.M. the Osprey 4 miles on our lee-beam. Tacked, as per signal: course, N.N.E. wind, E. and more moderate.

At 2^h, both vessels set top-gallant-sails:—rate of sailing, about 5½ knots.

At 4^h, the wind increasing, both vessels furled top-gallant-sails.

At 5^h, the Osprey about 8 miles upon our lee-quarter; the Transit having gone immediately to windward of her, at the rate of a mile per hour, since we steadily preserved our course to the wind. Tacked, as per signal, and bore down to the Osprey, not wishing to increase our distance. Being now fully convinced of the Transit's superiority of sailing, with different degrees of wind, both close hauled and large; by the consent of Captain Corner, I hailed the Osprey, and requested to know if Captain Irwin was perfectly satisfied with the trial that had taken place, and if he now intended running for Spithead. He returned for answer, that he

was perfectly satisfied with the trial that had been made; but as the wind was, he saw no prospect of reaching Spithead till the next day: however, if I had reason to believe the Transit would perform the task, he granted me permission to part company. In consequence of this reply, I immediately hoisted the colours, and stood in for the land, under a press of sail, with a fresh breeze at E.; the vessel lying up N.N.E. ½ E. and the Culver Cliff bearing N. by E. 5 leagues. The Osprey tacked, and stood after us; but by 7h, she was nearly hull down, and we soon lost sight of her for the night.

At 8h, made a short tack to weather the buoy of the Ledge, and then stood up for Spithead.

At 9h, passed the stern of the *Royal William*, and half past 9h, after making several short tacks, with a light breeze, we anchored off Haslar Hospital, when Captain Corner, and Mr. Brown the pilot, left the Transit.*

July 25. At 9h A. M. the Royal William's people left the vessel, with three cheers at parting. In the course of the morning, I received the congratulations of many naval gentlemen, strangers as well as friends, on the sig-

* N. B. The Transit's greatest angle of heel, during this cruise, was about 10 degrees.

nal success of the Transit, each making it a point to inquire for my opponent, of whom I could only say—*that she was left behind.*

At 1^h P.M. the Osprey came to an anchor. I went on board her immediately, to return my signals and instructions; when Captain Irwin and his officers, one and all, congratulated me on the very superior sailing of the Transit, and trusted I should meet the reward which, they said, the invention merited. They could not have believed it possible for any vessel to out-sail the Osprey, in the manner she had been out-sailed by the Transit They remarked, when beating to windward, and pressed with sail, that they had not a dry jacket before their main-mast, and were astonished to observe several persons sitting perfectly unconcerned on the Transit's top-gallant-forecastle. "But, let me ask," added Captain Irwin, "when did the Transit come to an anchor; for the people at the mast-head have been upon the look-out for her all this morning?" I replied, "that she passed the stern of the *Royal William* last night, at gun-fire."—"Last night, at gun-fire!" reiterated Captain Irwin, "then the Transit is a *very Devil!* We ourselves stood in after the Transit, but we fetched in with the land so far to lee-ward in Sandown Bay, that we were obliged to stand off and on for the night,

which proved so rough and squally, as to put us under close reefs."

In the course of the next day, Captain Corner forwarded his report of the Transit's sailing, to the East India House, and Captain Irwin's was transmitted to the Admiralty, but was afterwards sent to the India House.

On the occasion of this signal victory, a meeting of the subscribers to the Transit was held at the Chapter Coffee-house; and it is pleasing to relate, that each gentleman was so highly elated with this official and public proof of the Transit's easy and superior sailing, that the only consideration was, how best to promote the interest of the inventor. To these gentlemen *Mr. Gower* feels highly indebted, for their truly liberal conduct in this, and in every transaction relating to the Transit; and he begs leave in this place to return them his sincere thanks.

Not hearing from the East India Company, after patiently waiting, he, by the advice of his friends, on the 30th of July, attended at the East-India House. There he spent the day in walking in the passage, and making ineffectual efforts to gain the notice and an audience of the Chairman.

In the evening, whilst relating the history of the cruise with the Osprey, and remarking

on this seeming neglect of the Chairman, to a jocose optician, then living near the India-house,—but now no more:—the optician begged leave to observe, "that the image which had been seen of a patron in the person of the Chairman, might prove no other than an optical illusion, and suggested the propriety of my returning to the Transit, instead of risking the loss of convoy, and of getting into trouble by dancing attendance on fanciful images at the India-house."—It should seem, that the optician was a prophet; for the inventor never set eyes on the Chairman afterwards!

At the same time, it might be considered as the height of ingratitude not to observe, that he feels obliged to the East India Company, for promoting this official testimony of the Transit's superiority in swift sailing, with ease and dryness; and he cannot forego this favourable opportunity of publicly returning his thanks for a vote of 50 guineas, presented when a young officer in the India service, as a reward for the invention of *an instrument to measure the velocity of vessels*;—a description of which will be found in this "*Supplement.*"

On the 8th of August, the Transit's cargo was reshipped, and on the 27th, 1801, she sailed for Lisbon, under convoy of the Triumph, of

74 guns, Captain Sir Robert Barlow; the Hydra and Solebay frigates, and the Netley schooner.

*The following is a brief Journal of the Transactions of the Lisbon Voyage, with Remarks on the Behaviour of the Transit.**

Aug 28. The fleet standing down Channel, with a leading wind. The Transit keeping way with the convoy, with her fore-top-sail on the cap, fore-stay-sail, and the second and third after-courses.

Aug. 29 The fleet standing down Channel, with light variable winds.

Aug. 30. Pleasant variable winds. The Transit being astern of the fleet, which was proceeding at the rate of three knots *upon a wind*, we made sail, and headed the convoy in one hour. The convoy extended about three miles, so that we doubled their rate of sailing.

Aug. 31. Wind variable, with thunder, lightning, and rain:—keeping way with the convoy, with very little canvass set.

Sept. 1. Strong northerly winds. The fleet mostly under double-reefed top-sails, and

* N.B. The Transit's cargo being again completed, it must now be remembered, that she no longer continued in the same fine sailing trim as when in company with the Osprey.

close-hauled to the westward. At 3h P.M. being three miles to windward of the fleet, which extended about four miles, and making two miles of head-way, we set the reefed courses fore-and-aft, and the double-reefed fore-top-sail. Under this small quantity of canvass, we bore-up for the fleet, and wore round the headmost ship; then sailed down the middle of the fleet—wore round the sternmost ship—and up the fleet again, to abreast of the Commodore; in one hour and three quarters.

Sept. 2. Blowing strong, to the N.W. with very hard squalls. Mostly lying-to for the ships to join us from Falmouth. The Hind frigate joined the fleet. At 8h A.M. blowing hard to the N.N.W. the fleet bore-up for Torbay. At noon, more moderate. Many of the fleet under a press of sail before the wind, carrying studding-sails and royals. The Transit keeping way with the fleet, under reefed fore-stay-sail, and the fore-top-sail close-reefed and clewed up.

Sept. 3. Blowing fresh at the W.N.W. Lying-to, during the first and middle parts. At day-light, made sail for Torbay; and at 3h P.M. came to an anchor in the Bay: Brixham harbour bearing south, one mile. The fleet at anchor consisted of about 80 sail.

The fleet continued at anchor till the 10th, when the wind springing up at S. E. the Commodore made the signal to unmoor, and at day-light to weigh. The wind blew immediately into the Bay, a pleasant working breeze. By 8h A. M. all but six sail, which included the Transit, were under way, and beating to windward.

At this time I went on shore with the Transit's empty water casks, which were to be filled, and taken on board, with orders for the boat to be in waiting for me at the Cove, near the vessel. I now walked to the Post-office, and then proceeded leisurely over the heights, towards the Cove. On the heights were collected a concourse of people, to gaze at the sailing of the fleet, which, in consequence of the beating wind, formed a pleasing marine view.

By the seafaring part of the multitude, many curious remarks were made about the Transit, which served to amuse me as I sauntered onwards. At this time, some signals being enforced, by several guns fired from the men of war, and observing a gentleman near me with a spying-glass, I requested permission to look at the signal which was flying. This circumstance brought us into conversation; and he gave me to undersand, that he was Coast-agent to the underwriters. He blamed

several masters of the fleet, for their backwardness; and he found particular fault with the Captain of the four-masted vessel, "*whose conduct he feared he should be under the necessity of reporting at Lloyd's, as it was not likely the vessel would beat out of the Bay in time to save convoy.*" At this period, all the fleet had been some time in motion, save the Transit and the Netley schooner; and many of the fleet were without the Berry Head.

I smiled, and explained who I was; observing, that I trusted he would find no reason to report the *ill*-conduct of the Transit; but if he would be so kind as fairly to state her behaviour on this occasion, I had no doubt it would prove gratifying to her owners, and the gentlemen who had insured her. This request he promised faithfully to perform; and I left him, to join the vessel.

At 10^h 30′ A. M. weighed and made sail. On the second tack, the Transit came fast up with the vessel of an old friend, who had been labouring hard from six in the morning, tacking backwards and forwards, with scarcely more profit than "*Labour in vain.*" This vessel had joined the fleet from Falmouth, at a time when it blew so fresh as to oblige the Transit to be under bare poles, which caused her small masts to make a very slender appear-

ance, and gave rise to an observation of my friend's officer, who, addressing his captain, said, "*Pray, Sir, have you seen* STICKS?"—"*Sticks!*" replied the captain, "*who do you mean?*"—"*Oh, Sir, I'll shew you* STICKS," returned the officer; "*I never saw such a vessel in all my life; it looks like a wood afloat!*" and immediately pointed out the *Transit*. Ever after this circumstance, the *Transit* was ludicrously titled *Sticks*, by the whole ship's company of my friend. Wishing, therefore, to pay them off in their own way; as the Transit came up on their weather quarter, I hailed, "*On board the* LABOUR-IN-VAIN, *a-hoy! here comes* STICKS!" and left them, seemingly very sulky; somebody muttering, "*You may go to the devil; but I wish we had your* STICKS!"

By noon, the vessel was without side the Berry Head; and at one, having made five tacks, she was the weathermost vessel of the fleet, with the Bay open. In this position, we hove the fore-top-sail to the mast, and hoisted our colours, the more clearly to shew our situation to the gentleman I had left on shore, to record our deeds.

On the author's return to England, he found the gentleman had faithfully performed his promise; for which good office he returns this entire stranger his sincere thanks.

Sept. 11. At 3^h P. M. a vessel came to an anchor off the Berry Head, to save her from going on shore.

At 4^h, six or eight sail were seen embayed off Dartmouth; the *Harmony* being at anchor, within half a cable of the rocks. About twelve vessels also remained in Torbay, not having been able to weather the Berry Head.—In turning out of the Bay, many of the vessels must have made from 15 to 20 tacks.

At 7^h, the Commodore hove-to, and the Hind frigate returned into the Bay.

At noon, the Hind joined the fleet, with the vessels that remained in the Bay.

Sept. 12. Cloudy weather, with light south-easterly winds. On the first and latter parts, the fleet proceeding down Channel; but lying-to all the middle part of the 24 hours, for a fleet to join out of Falmouth. At noon, the Lizard N.W. by W. 4 leagues.

Sept. 13. Light easterly winds:—at times, calm:—the fleet proceeding down Channel.

Sept. 14. Weather as yesterday, with a high swell from the westward, which caused many ships of the fleet to roll exceedingly deep. Captain Warrington, of the Harmony, dined on board, and remarked the material

difference between the motion of his own ship and the Transit. At noon, the Land's End N.N.E. ½ E.

Sept. 15. The weather as yesterday, with much westerly swell: the fleet rolling exceedingly deep: the Transit perfectly easy:—ninety-four sail in company.—Course, S. 56° W.—dist. 17′—lat. 49° 32′ N.—lon. 6° 3′ W.

Sept. 16. A pleasant leading breeze at N.E. with smooth water. The day being favourable for trying the set of the Transit's studding-sails, the booms were rigged out; and, to admit of sufficient run, without heading the convoy, we were about to drop astern. This being perceived from the Hydra, we were called in by signal. In consequence, we closed with the Hydra, and asked permission to drop; which was granted by Captain Paget.

At 11^h A.M. being several miles astern, made sail for the fleet, with all the square-sails set on the fore-mast, and three studding-sails on the larboard side. The fore-and-aft sails were also set, and the vessel was steered so as to keep them barely drawing. At this time, the Hydra hove-to, and at $11^h\ 30'$ hauled towards us, with her studding-sail-booms rigged out. This circumstance gave us clearly to understand it was Captain Paget's intention to put the Hydra against the Transit, whilst

before the wind.—Course, S. 61° W.—dist. 60′—lat. 48° 57′ N.—lon. 7° 44′ W.

Sept. 17. At 30 minutes past noon, the Hydra joined. She shaped a course with ours, under her square sails, and the larboard studding-sails forward. She was distant about half a cable, with her head on our starboard beam. Perceiving the Hydra rather dropping, they now crowded more sail than I had ever witnessed,—even fore, main, and mizen royal-studding-sails on each side; with gaff mizen-top-sail, and in short, with every sail that could possibly be set, with the wind as it was, save sky-scrapers. On board the Transit, we had no more sails to set; but I longed to discharge a few hundred bags of salt-petre over the side; when, without doubt, we should have shewn to the Hydra a distant view of our stern. In this manner, we sailed side by side, for an hour; when the Commodore, by signal, called us to the fleet. If either could be said to have the advantage, it certainly was with the Transit. The fleet at the time was sailing between three and four knots, and ourselves between seven and eight knots.—Course, S. 53° W.—dist. 60′—lat. 48° 2′ N.—long. 9° 4′ W.

Sept. 18. Blowing hard from the northward, with a high sea. The men-of-war, and many of the fleet, with top-gallant-yards

down. In the night, a brig rolled away her main-top-mast. The Transit perfectly dry; but the water was observed to roll completely over every vessel of her tonnage.—Course, N. 37° W.—dist. 102′—lat. 46° 31′ N.—lon. 10° 33′ W.

Sept. 19. Squally weather, throughout: wind, from N. to N. W.—The sea greatly abated.—Was hailed by a north-country vessel, commanded by Captain Sanderson, a quaker, who remarked the ease and steadiness of the Transit yesterday, compared with other vessels.—Course, S. 14° W.—dist. 70′—lat. 44° 5′ N.—lon. 10° 51′ W.

Sept. 20. Squally weather, with a great deal of sea:—wind, from north to N. E.—Captain Warrington informed me, that he particularly noticed the Transit to be the most steady vessel of the fleet, during the rough weather, on the 18tn, and that he frequently envied our comfort.—Course, S. 10° W.—dist. 82′—lat. 43° 30′ N.—lon. 10° 53′ W.

Sept. 21. Pleasant steady weather, throughout. The Oporto ships quitted the fleet, under charge of the Netley.—Course, south—dist. 94′—lat. 41° 53′ N.—lon. 10° 50′ W.

Sept. 22. Pleasant steady weather, throughout; wind, north.—At 9h A. M. the Hydra ordered us to make sail a-head, in quest of a brig bound for Lisbon. At 10h, the Hydra

made the signal for the Lisbon convoy to part company, and *our* signal to come within hail. At 11h, within hail of the Hydra, when Captain Paget requested me, "as the Transit was so excellent a sailer," to chase, or to take charge of the convoy, occasionally, as he should judge necessary. This circumstance he wished me to make known to the whole convoy, to prevent any inattention on their part to the Transit's signals. Between eleven o'clock and noon, we hailed every vessel of the Lisbon convoy, being eighteen in number; and the sternmost was five miles from the Hydra.—Course, S. 10° E.—dist. 84′—lat. 40° 26′ N.—lon. 10° 30′ W.

Sept. 23. Wind east, with pleasant weather. At 10h A. M. the Hydra made our signal. At 10h 30′ Captain Paget requested me to inform the convoy they were not to pass the Bar of Lisbon till he should have communicated with the British Minister at the Court of Lisbon. By noon, we had hailed all the convoy, except one, which was a-head of the Hydra. The Rock of Lisbon bore S. by W.—Course, S. 21° E.—dist. 68′—lat. 39° 12′ N.—lon. 9° 35′ W.

Sept. 24. Wind northerly, with pleasant weather. At 1h P. M. Captain Paget requested me to keep near the Hydra, as he shortly intended to send a Lieutenant on board, to

proceed to Lisbon in the Transit. At 2^h, the first Lieutenant of the Hydra came on board. Took the Hydra's boat in tow, and made sail for the Rock of Lisbon. The Lieutenant informed me it was Captain Paget's intention to press two men from each of the fleet; but, in consequence of the good services of the Transit, he was desired to say her crew should remain untouched.*

At 5^h 30′ rounded the Rock of Lisbon, and at 7^h anchored off Fort Cascaes; when the Lieutenant proceeded to Lisbon in his boat. At parting, he requested me to continue at anchor till his return, and to remain at quarters during the night, in case of a sudden attack from Spanish privateers. At day-light, hoisted jack, ensign, and pendant; and in every respect assumed the appearance of a King's vessel. At 10^h A. M. the Lieutenant returned; but as it was nearly calm, he proceeded to the Hydra (then far out in the offing) in his boat. At noon, the fleet bore up for Lisbon:—lon. at anchor, 9° 23′ W.

Sept. 25. At 1^h P. M. weighed with a light breeze, and proceeded up the river Tagus. At 4^h, passed Bellum Tower, which fired two shots, and obliged us to anchor, to receive the "Visit of health."

* See Note B. in the Appendix.

Sept. 26. Weighed anchor, and proceeded to our moorings immediately, off the stairs ascending to the Grand Equestrian Statue.*

On our arrival, we found the hailing of the convoy, on the preceding day, had been viewed by the officers of the fleet with a degree of pleasure, mixed with astonishment. During the first time of our hailing the fleet, many of the ships were lying-to; but, during the second time, they were proceeding at the rate of four knots, with the wind aft, which gave us the most favourable opportunity of thwarting the fleet from side to side, and veering or staying the Transit, as best suited our purpose; the ready and easy execution of which, could not but have produced a pleasing effect on every seaman in the fleet.

During our stay at Lisbon, the Transit roused the curiosity of the Portuguese, and became a subject for their print-shops, which represented her under various circumstances, in different points of view.

Intelligence was received of a general peace, and vessels might now proceed from Lisbon in safety, without convoy, after the 10th of November.

Nov. 7. Unmoored, and led down below the crowd of shipping.

* In confirmation of the facts relating to this passage, see *Certificates*, N° 1 and 2, at the end of this Tract.

Nov. 9.—A. M. sailed the Duke of York, the Post-Office Packet.

Nov. 12. Received on board the remainder of the cargo, and prepared for sea. At 10^h A. M. the Betsey, Quilton, sailed for London, with a strong and fair breeze, at S. W.—P. M. the passengers came on board.

Nov. 13. At 7^h A. M. the pilot came on board; weighed, and made sail, with a light air at N. E.—The breeze increasing, the pilot left us at 10^h A. M. having cleared us through the South Channel. At noon, the Rock of Lisbon, E. N. E. five miles.

Nov. 14. Fresh winds from the N. N. E. and squally weather. At day-light, several sail in sight, standing to the westward. At 8^h A. M. came up with, and hailed a brig on the same tack. Her captain pointed out the Betsey, hull-down, on our lee-beam.—Course, N. 73° W.—dist. 86′—lat. 39° 16′ N.—lon. 11° 37′ W.

Nov. 15. Fresh winds from the N. N. E. with a head-sea, but sailing perfectly dry. Passed several sail on the same tack.—Course, N. 50° W.—dist. 88′—lat. 40° 6′ N.—lon. 13° 15′ W.

Nov. 16. First part, fresh breezes: middle and latter, blowing very hard from the N. E. with a high head-sea. Took a second reef in the fore-top-sail, furled the after-top-sails, and reefed the courses. Under this snug sail, the

vessel made good steerage-way, with the helm a-mid-ships, without shipping any water. This was the hardest gale we had experienced.—Course, N. 55° W.—dist. 60′—lat. 40° 48′ N.—lon. 14° 35′ W.

Nov. 17. Wind E. N. E. and moderate, with much less sea: A. M. out all reefs: passed two sail on the same tack.—Course, N. 24° W.—dist. 92′—lat. 42° 20′ N.—lon 15° 36′ W.

Nov. 18. Mostly blowing hard from the N. E. with a high sea. Sailing under reefed top-sails, perfectly dry, and making only a point of lee-way. At 4h P. M. tacked, and stood to the eastward.—Course, N. 18° W.—dist. 37′—lat. 43° 1′ N.—lon. 16° 22′ W.

Nov. 19. Wind N. N. E. blowing hard, with very heavy squalls, but less head-sea: sailing through the squalls under reefed courses, fore-and-aft,—reefed after-top-sails, and close reefed fore-top-sail. Under this press of canvass, the vessel rose with life to the sea, making four knots of head-way, with very little lee-way.—During these few last days of trying weather, and carrying a press of sail *upon a wind*, it was pleasing to observe the little play of the masts, or chafe about the rigging. No unpleasant cracking noise was heard about either hull or rigging, and the vessel appeared scarcely sensible of the weight of her

masts.—Greatest angle of heel, when carrying a press of sail, twelve degrees.—Course, N. 68° E.—dist. 71′—lat. 43° 31′ N.—lon. 15° 6′ W.

Nov. 20. Wind N. by E. First part moderate, latter part very hard squalls. Handed the top-sails, and sailed under reefed courses fore-and-aft: came up with an American brig on the same tack, bound for Bilboa.—Course, N. 76° E.—dist. 70′—lat. 43° 58′ N.—lon. 13° 34′ W.

Nov. 21. Wind north: first part moderate weather; latter, blowing fresh; a high sea throughout.—Course, N. 54° E.—dist. 74′—lat. 44° 45′ N.—lon. 12° 31′ W.

Nov. 22. Wind north: blowing strong throughout, with a high sea:—carrying a press of sail under reef'd top-sails and courses: sailing perfectly dry.—At 2^h P.M. passed the Duke of York Post-Office packet, standing to the westward. This vessel sailed *four* days before the Transit, with a fine easterly breeze.*—Course, N. 53° E.—dist. 87′—lat. 45° 42′ N.—lon. 11° 7′ W.

Nov. 23. Wind north: first and middle part squally weather, with a high sea: latter moderate, with less sea than for some days past.—A.M. out all reefs.—Course, N. 47° E.—dist. 77′—lat. 46° 42′ N.—lon. 9° 53′ W.

Nov. 24. First part, an increasing breeze, with the wind at north: middle, blowing hard,

* See Note C in the Appendix.

at N. W. by N. which admitted us to sail a point free:—latter, blowing exceedingly hard. —Furled the after-top-sails; close reef'd the fore-top-sail, and reef'd the courses. Smooth water, considering the strength of the wind. At noon, sounded, and got ground at eighty-three fathoms; fine sand, mixed with broken shells. —Course, N. 25° E.—dist. 150′—lat. 48° 53′ N. —lon. 8° 18′ W.

Nov. 25. Wind N. W.: blowing hard throughout, with much rain at times.—Bore up for the English Channel, being the first of our sailing with a flowing sheet since we left the Bar of Lisbon. At 10ʰ A. M. saw the island of Guernsey, bearing S. by W. six leagues.—Course, N. 65° E.—dist. 177′—lat. 49° 58′ N. —lon. 4° 20′ W.

Nov. 26. Wind N. W.: first part, blowing hard, with rain: middle, exceedingly hard: latter, more moderate.—At 3ʰ P. M. saw the Isle of Wight.—At 1ʰ A. M. hove-to, off the Oars—at day-light, made sail.—at 11ʰ, rounded Beachy-Head, very close; and at 4ʰ P. M. came to an anchor off Deal Town.

Nov. 27. A. M. the wind sprang up to the S. E. and increased to a very hard gale, with a heavy fall of snow—at day-light, a pilot came on board—at 10ʰ A. M. got under way for the river, and anchored off Purfleet, in the

Thames, before 4^{h} P. M. Making fourteen days and a few hours from the Rock of Lisbon; five good hours of which were lost by lying-to off the Oars.

Taking a general view of this passage, it appears, that from our quitting the Rock of Lisbon, to soundings in the English Channel, it blew, for the most part, gales of wind, attended with a high head-sea, and scarcely ever varied more than a point from N. N. E. which is almost as foul a wind as could well blow from the heavens. Notwithstanding these unfavourable circumstances, the Transit made her passage, from Lisbon to soundings, in eleven days; performing the distance on two tacks. The first tack, stretching off from the coast of Portugal, took up five days, and brought the vessel to the lat. of 43°1′ N. and lon. 16° 22′ W.—and the second tack, stretching to the N. E. brought the vessel to soundings in the English Channel, in six days more. Comparing the outward and homeward passage, it appears, that the passage out, in convoy, with a *fair* wind, was made in thirteen days, from Torbay to Lisbon; and that the same distance home, when alone, with a *foul* wind, was performed in the time of twelve days only.

On the inventor's arrival in London, he

reported the sailing of the Duke of York Packet from Lisbon; and, as the vessel had not arrived, it naturally caused some uneasiness at the Post-office. The inventor was therefore requested, on 'Change, to step over to the Post-office, and relate what he knew of the Packet. He stated that the Duke of York sailed on the 9th of Nov.—That the Transit sailed on the 13th, and passed the Duke of York, standing to the westward, on the 22d, seemingly all well, save, as he supposed, a little sea-sick.—Being questioned to account for the Packet's non-arrival, he answered, that the wind had been against her; and he was firmly of opinion that no vessel of the ordinary construction could have made her passage from Lisbon, with the winds that had prevailed since the sailing of the Transit.

It is worthy of remark, that on the 25th, after the Transit had borne up for the English Channel, the wind veered to the N. W. which fair wind, it is reasonable to suppose, must have extended to the Duke of York, which was then to the westward, and have favoured her arrival. However, be this as it may, it is certain she did not arrive at Falmouth till the 30th of November—the time of her passage having taken up twenty-three days, part of which, as before stated, it is reasonable to be-

lieve, was accomplished with four days of fair wind, which of itself is almost sufficient to perform the whole passage:—opposed to this, the Transit performed nearly the same distance, with totally contrary winds; in less than half the time.

The vessels that sailed from Lisbon about the same time with the Transit, arrived in the course of three weeks. Of the number was an American, a few tons of whose freight had been taken on board the Transit, and occasioned the inventor to seek the vessel on her arrival in the river. In conversation with the American captain respecting the difference of our passages, and comparing circumstances, it appeared that the American, which sailed on the same day with the Transit, in endeavouring to beat to windward, from Lisbon, had gone to leeward, and was in the latitude of Cape St. Vincent, on the day the Transit was in the latitude of Cape Finister!*

The contrast here proved between the sailing of the Duke of York Post-Office Packet and the Transit, when out of trim, the merchant will naturally, for his own sake, conclude to be a subject worthy the attention of the Post Masters General.

* In confirmation of the Transit's weatherly property, vide *Letters*, N° 3 to 10, at the end of this Tract.

If the Post-Office Packets will not perform their passage with a foul wind, it certainly is of consequence to the public to employ such vessels as will do their duty with every wind.

Should it ever happen, that vessels of the Transit's construction became an object of consideration with the Post Masters General, the following observations may prove of moment.

Packets are not required to court an engagement, but to do their utmost to escape from the pursuing enemy. Such being the case, it is recommended so to stregthen and dispose the stern of a packet, as to enable it to carry four stern-chase guns, at least. Such a battery, in a length of chase, will allow of the most favourable chance of disabling the masts of the enemy—for chase guns, not being affected by the rolling of the vessel, are fired with greater certainty of doing execution, than guns fired from the broadside.

A vessel thus fortified, and so steered as to preserve her opponent immediately in her wake, would prove a dangerous antagonist to a vessel even of considerable force, which is frequently prevented from using her bow-chase guns, as their recoil would have a tendency to destroy the head-way, so material to the chaser.

It is matter of astonishment to the author,

that so obvious a mode of defence has not been adopted on board of merchant-ships, instead of a parade of guns on the broad-side, without men to fight them. To be released from their lumber, would also add much to the comfort and accommodation of the crew.

It would be sufficient to defend the broadsides by swivels, small-arms, pikes, and boarding-nets, to save the vessel from being boarded by small craft, in calm weather, or at anchor.

Packets should be provided with sweeps also, or some more manageable contrivance, to give the vessel head-way in calm weather.

By adopting the Transit's construction, and with this mode of defence, the author is firmly of opinion, that a packet of 200 tons burden might be navigated with a complement of fourteen hands, at one-third the expense of the present packets; and certainly with greater expedition, more comfort, and less risk of being taken by the enemy.

Some time after the Transit's return from Lisbon, she was purchased by Messrs. St. Barbe, Green, and Bignel, as a fit vessel for the Mediterranean trade, provided she proved capable of performing double duty, or two voyages to Constantinople and Smyrna in the course of the year. The command was given to Captain Muirhead, a very intelligent sea-

man, with power to act as to him should appear necessary to forward this design. It being a time of peace, the vessel was at liberty to pursue her voyage without the control of convoy. She sailed from the river, for Constantinople and Smyrna, in July 1802, and arrived at the former place after a short passage, considering the unfavourableness of the wind; having also effected the passage of the Dardanelles, which at that season of the year (in consequence of the current) is considered impracticable with a foul wind. This circumstance drew the particular attention of the Turkish Government, who were not blind to the advantage to be derived to their nation by adopting the construction of the Transit. With Captain Muirhead's permission, therefore, the Captain Pacha ordered the master shipwright, a Frenchman, and the leading tradesmen of the arsenal, to take complete dimensions of the Transit, with a view to the immediate building a similar vessel. Returning home from Smyrna, the Transit arrived in the Downs on the 29th of December, having performed the voyage in about four months and three weeks. The *Pelican* and *Queen*, two very fast-sailing vessels, sailed from Smyrna before the Transit,—the *Pelican* seventeen days, and the *Queen* eight days;—but the

Pelican did not arrive till thirteen days after the Transit, and the *Queen* passed up the river as the Transit passed down outward on her second voyage.*

The inventor having frequently experienced the evils arising from loading the extreme ends of a vessel,† had fitted up the Transit with cabins at the head and stern, which were separated from the hold by strong bulk-heads:—these also assisted to tie the body of the vessel. The extremities of the vessel being thus converted into accommodations for the officers and crew, became, for the most part, empty space, which by its buoyancy could lift the vessel to the following, or meeting, sea; and it was pleasing to observe the life and

* For an account of her performance on this voyage, vide *Letters*, N° 4 to 10, at the end of this Tract.

† For instance, the bluff and loaded bow, being ſpecifically heavier than water, has no power to lift the vessel to the meeting sea; she is thereby overwhelmed, and suffers so sudden a check to her head-way, that the masts become materially endangered. To soften the threatened consequences to the masts, the head-sails must be furled, although probably the vessel is thereby deprived of the uſe of ſuch a wind as would enable her to make good her proper course. Thus to get rid of one evil, another is introduced; which might be avoided by sailing with empty extremities. The loaded stern also, for the same reason, has no power to lift the stern to the following sea,—which consequently may break on board, and do infinite mischief.

dryness with which the Transit would pass over the meeting sea, when pressed with sail, *upon a wind:*—but the inventor was doomed to see this plan destroyed. For the sake of stowage, both cabins were turned into Hold; and for the accommodation of the officers and crew, and for the stowage of the cables, a large heavy poop was erected, the height of which obliged them to reduce the after-courses:—it also obliged them to throw aside a simple and convenient mode of steerage, which they exchanged for a lumbering, inefficient, and unmechanical contrivance.*

The inventor was frequently told by seamen, who viewed the model of the Transit previous to the building of the vessel, that such a form of body would be very wet, from the leanness of the bow. "*She wants more harpin,*" was the great call out:—"*this vessel will fairly dive.*" On these occasions, he would put the following question: Is a vessel in any manner supported by a bow, however full and bluff, if that bow be loaded with articles specifically heavier than water; which certainly is too much the practice? The truth is, that such a bow will only plunge the vessel deeper into the sea, and stop her progress by its bluffness.

* See Note D, in the Appendix.

It was on the 21st of February, 1803, that the Transit left the river a second time, for the same destination. On Captain Muirhead's arrival at Constantinople, he found the Turks had nearly completed the hull of their promised Transit, which was executed with peculiar neatness; but they had deviated from the exact form of the Transit, in favour of old customs, particularly by the introduction of a much finer body.

The present commander of the Transit, was lately given to understand, by an Archipelago pilot, who once had charge of the Turkish Transit, that upon a wind she was so extremely tender, as to be unable to carry sail. This evil certainly was occasioned by the fineness of the body, which lessened her capacity, and consequently her ability to carry sail.*

* The fineness of the after body, particularly of ships of war, occasions evils which are not sufficiently considered. A vessel from the launch, without ballast, will *naturally* float many feet by the stern, but as her sailing-trim is nearly on an even keel, the stern must be *artificially* lifted by the disposition of the cargo; consequently, as the stern no longer floats, its stability is destroyed, and the whole superstructure of the stern can be viewed in no other light than as an incumbrance to the vessel; which, by its hanging weight, has a tendency to destroy the fabric, and to produce uneasy motion in a heavy sea. It has been said, that the stern of a ship of war, by its

The war with France being renewed, the Transit returned home with convoy, which completely destroyed the benefits which were to arise from her superior sailing.

In the month of July, 1804, the Transit sailed from Spithead, in convoy, on her third voyage to the Mediterranean Sea, deeply laden.

On her return from this voyage, she underwent a complete repair, and was coppered anew. The command was given to Mr. Liston, Captain Muirhead being appointed to a larger vessel, belonging to the same employ. At this time she was put upon a respectable war-establishment, with liberty to make the best of her way; and she sailed on her fourth voyage to the Mediterranean, in April 1805. On her outward passage, when off Cadiz, at midnight,

own hanging weight, will be broken down, six or eight inches, after launching; and the tremulous motion of a fine run, occasioned by the striking of a heavy sea, is absolutely frightful. However, while the midship-body is continued full, the run of necessity must be fine to affect the steerage of the vessel.

The form of the midship-body of the Transit avoids the necessity of a fine run, for the sake of steerage; consequently, she floated from the launch *naturally* on an even keel; and her body now remains as straight afloat as on the stocks. At sea, too, her stern does not suffer the tremulous motion of a fine run.

the rising moon brought the Transit into view, in the centre of the combined fleets of France and Spain, which were standing out of Cadiz; — the same fleet which remained no more after the victory obtained by the ever to be lamented NELSON, off Cape Trafalgar! At first it was supposed to be the British fleet under Nelson, but the hailing of a French frigate explained their true situation. The frigate was to windward, and being upon the opposite tack, she wore short round the Transit's stern, and shooting up under her lee, fired four shots. The Transit now hauled her wind close, and made all sail. The frigate did the same, but from this time dropped, and finding no chance of nearing the Transit, while her masts were standing, she hove round her broadside, and fired twelve more shots,—but, all without effect; and the manœuvre caused her so much loss of head-way, that she soon after wore, and bore up for her fleet. The Transit performed this voyage, from the river to the river again, in three months and thirteen days.

Early in August, 1805, the Transit again sailed for Smyrna, a running vessel, being her fifth voyage to the Mediterranean Sea. In the Gut of Gibraltar, she was attacked by Spanish gun-boats, but escaped by superior sailing.

She arrived in the river on the 10th of December, having been absent on the voyage about four months; and having completed the two last voyages to Smyrna in less than eight months.

Her sixth voyage has been attended with circumstances so highly demonstrative of her weatherly properties, as to deserve a more particular description.

The present owners of the Transit having gained intelligence that certain vessels* were about to sail on a voyage to Smyrna, with such goods as were then in great request at that place, resolved on freighting *her* for a similar purpose. These ships set sail from Torbay on the 27th of March, 1806.—What with the late period at which this piece of information came to the owners, and what with the time employed in procuring the goods, and conveying them on board, the Transit could not be finally dispatched before the 21st of April following, on which day she set sail from the Downs, without convoy. She passed these vessels, her opponents in trade, at Gibraltar, on the 3d of May; and, prosecuting her voyage, arrived at Smyrna on the 2d of June, being a passage of forty-two days. The other

* *Viz.* the *Mentor*, Briton; the *Swallow*, Kerr; and *George*, Lewellin.

ships did not arrive till about six weeks after, by which time the Transit's cargo had been disposed of.

From Smyrna she sailed to Constantinople, where a highly favourable opportunity occurred of exhibiting her valuable powers, to the Turkish court and navy; at a time when she was fortunately without a cargo, and in complete sailing trim.

Five miles above Constantinople, on the banks of the Strait, the Grand Seignior has a country palace, where he spends a considerable portion of his time. Off this palace there is generally stationed a fleet of Turkish men-of-war, which consisted, at that time, of several line-of-battle ships, a frigate, and a brig, the two last being considered as the most weatherly vessels of their navy, more particularly the brig. When the wind and current are setting through the Strait, from the Black Sea, it is customary to exercise the seamen of the fleet, by turns, on board these vessels, by stretching across and across the Strait, and endeavouring to beat-up against the current; which not only serves to give practice to the sailors, but is also an amusement to the Grand Seignior.

On the 22d of August, 1806, the frigate and the brig were under-way, but it coming

on to blow fresh, the frigate, when mid-channel over, was driven down to Constantinople by the force of the wind and current, where she brought up with all sails standing, to avoid being carried into the Marmora Sea; and it so happened, that her anchor was dropped half a mile to windward of the Transit, then on the point of sailing. At this period Captain Liston had a party on board to dine, to whom he had promised a sail to windward, previously to his bearing-up for Smyrna. The party consisted of Messrs. John and Thomas Prior, and Mr. Maltass, with several other gentlemen. Captain Liston observing the frigate, explained to the company the catastrophe that had befallen her, and being perfectly aware of the Transit's weatherly properties, in her best sailing-trim, resolved on shewing them some good naval sport. "Now, Gentlemen," said he, "I will exhibit the superiority of this vessel over the frigate, under similar circumstances, when adroitly manœuvred by British seamen."—It was now noon: the anchor was nearly a-trip, and the whole party on the tiptoe of expectation. On the second tack, after casting, the Transit weathered the frigate, and standing across the channel from side to side, was worked up a-breast of the Grand Seignior's country palace. Then, closing as much as

possible with the shore, Captain Liston hove-to, and complimented the Grand Seignior with a salute of eleven guns. At this time, the windows of the palace were thronged with spectators, consisting of a group of all ages and constitutions, contrasted by a selection of the most lovely young females that the eye of man ever beheld: — doomed, alas! to loiter away life in voluptuous inutility.

While the Transit had been working up from Constantinople, the brig had maintained her position, by getting into the eddy current in-shore; but now, by the order of the Turkish Admiral, the sailing of the two vessels was to be fairly established. In consequence of these orders, the brig bore down, and joining the weather quarter of the Transit, both vessels made sail together. On the first tack, the Transit weathered her opponent half a mile, and still continuing to weather her, the brig gave the palm of victory to the Transit, and ran for the eddy-water. Captain Liston continued to work the Transit fairly in the stream of the current, that the ability of the vessel to beat up against the current of the Strait of Constantinople, might be clearly understood by the Grand Seignior, and the officers of the Turkish navy. When two miles above the palace, the Captain bore-up, and running in-

shore, the Transit was hove-to for the comfort of the dinner-party. At the conclusion of the feast, he again made sail, and landed the party, in his way down channel, at Point St. Stephana; after which he proceeded on his passage to Smyrna.

Soon after Capt. Liston's arrival at Smyrna, he was given to understand that the Grand Seignior was so highly gratified by the superior sailing and manœuvring of the Transit, as to have caused a handsome purse of coin to be sent off in a boat, to be presented to her commander. The boat had nearly reached the vessel, just as she made sail; and even then, did not give up the chase till she had got into the Marmora Sea.—It is to be sincerely hoped, that the Captain will one day enjoy the treasure so nobly intended as a recompense of his merit!

On the 29th of September, the Transit sailed homewards from Smyrna, and arrived in the Downs on the 16th of November, being a passage of forty-eight days; and having been absent six calendar months and twenty-five days, seventeen weeks of which had been of necessity expended in the country.

To the foregoing historical relation may be added, that the Transit sailed from the Downs, on the 17th of February, 1807, on her *seventh*

voyage, bound to Constantinople and Smyrna; and that she encountered the dreadful gale of wind on the 18th, which dismasted and destroyed so many vessels. She arrived at Portsmouth two days after this gale, and, to use Captain Liston's own expression, "*without having overstrained a rope-yarn!*"—After this circumstance, it can never surely be asserted, by any one who is acquainted with the devastation occasioned by that gale, *that the small masts of the Transit are too slender to stand against heavy weather!**

Pursuing her voyage, she sailed from Portsmouth on the 28th of February, passed the Gut of Gibraltar on the 9th of March, and arrived at Malta on the 19th, having performed her passage from Portsmouth to Malta in twenty days, although, during two days of the time, it blew so extremely hard in opposition, as to prevent her making any progress whatever!

The present rupture with the Porte preventing Captain Liston from sailing to his original destination—on the 14th of April he sailed for Zante, were he arrived on the 16th.

* A picturesque representation of the Transit in two points of view, has been engraved and published by Mr. J. Jeakes, of Little Russel Street, Bloomsbury, from a beautiful picture painted by the ingenious Mr. T. Whitcombe.

Having procured a cargo, he sailed homewards from Zante on the 27th, and arrived at Gibraltar on the 16th of May.

On the 22d of May, the Transit sailed from Gibraltar, in company with the Princess Elizabeth Packet, Captain Ferresdale. In the Gut, these vessels were attacked by ten Spanish gun-boats, whose shot, luckily, all passed over them, without doing any injury to either. The next day after sailing, the Transit lost sight of her companion, and arrived in the Downs on the 8th of June; but the packet did not arrive at *Falmouth* till the 10th.

Notwithstanding the dreadful gale of the 18th of February, and a series of bad weather, the Transit's cargo, both out and home, was landed in the same good condition as when first shipped on board.

The author is not aware of the general time which is taken by the Government-packets to perform *their* passage to Malta, from *Falmouth*; but, with mixed winds, he trusts they cannot boast of passages like sixteen or twenty days from *Portsmouth!* Indeed, the good passages made by the Transit are now so proverbial with the London merchants, that a stranger to the author informed him, a short time since, that accidentally joining the merchants on the Turkey-walk, within the Royal Ex-

change, he overheard them conversing about news which had arrived by the "*Smyrna mail-coach!*"—being struck with astonishment at the expression, which to him was inexplicable, he begged to know the meaning—when he was given to understand, that the "*Smyrna mail-coach*" meant the *Transit four-masted vessel.*

For the most part, the inventor has had the opinions of naval judges delivered on the properties of his vessel, under the great disadvantage of a full cargo on board her; and, although they have been favourable, yet they have fallen short of her genuine worth, when viewed in her sailing trim, and employed on a service to which she was originally destined, namely, the Packet-service. So perfectly does the inventor feel himself master of all the necessary requisites for vessels of this sort, founded on the *experience he has derived from the excellencies and defects of the Transit*, that he will engage to superintend the building of a vessel,* which shall exceed her in most respects; provided she be confined to her destined employ, and be not altered without the will of the inventor; whereby the principles

* Any person who may be inclined to possess a vessel on the construction of the Transit, will be dealt with on liberal terms, by the patentee, by applying to Mr. John Blades, No. 5, Ludgate Hill, London.

of her build may be preserved without mutilation.

He fondly hopes, that by patiently waiting the decision of naval men, many of whom have generously complimented his exertions, and many of whom have been deprived of ever seeing his invention, by absence on their country's duty, he may convince the whole nation of the feasibility of his plan, and be the means of establishing an economical class of vessels, highly useful to the country, whether considered with a view to despatch, warfare, or commerce.

It is worthy of remark, that the Transit's cargoes have been constantly discharged *in the highest degree of perfection.* This good property arises partly from her easy motion at sea, which occasions so little distress to the hull, and partly from the *falling out* of the sides, which causes all the leakage-water to drain down the planking of the bottom, into the angle below, without wetting her skin or ceiling, where three feet of water may rest without injury to the cargo. A stranger to the vessel, on going down into her empty hold, and observing the general dryness of her skin, would scarcely believe it possible that the vessel had performed so many voyages as she has done.

The wear and tear of the Transit is com-

paratively so trifling, that her original small masts and rigging are still remaining, and do not appear much worn, notwithstanding the rigging, in the first instance, had done its duty in the shape of a Spanish cable, from which it was relay'd.

The Transit has been considered as incapable of taking the ground with safety; it has been supposed she would up-set, or be so slow at lifting, as to fill. However, the Transit has twice taken the ground, and totally sewed, without experiencing these evil consequences. Indeed, any one who attentively considers the form of the Transit, will be less apprehensive on this score. A vessel seldom takes the ground, but there is a steep side: if, therefore, attention be paid, before the Transit sews, to heel her in-shore, she will then rest secure upon the keel, and upon a considerable length of the in-shore bilge, leaving a hollow beneath the bottom, between the keel and the bilge. Now, as this hollow admits the returning tide to pass beneath the vessel, the adhesion is thereby destroyed, and the vessel is lifted without obstruction.—Should the Transit strike the ground, the keel evidently receives the blow, and wards it off from the bilge.

From what has been related of the Transit, it will certainly be admitted, that she has

fairly established a character, not only for despatch, but as a profitable trader, in time of peace. She has proved her ability to perform double duty with ease, if allowed to proceed without convoy; that she delivers her cargoes in a high state of preservation; and that she may be navigated at small expense, from the lightness of her rigging, and its trifling wear and tear. It may be said, she will not carry so much as another vessel of equal measurement—granted:—say that she carries even one-fourth less, yet still she will deliver more cargo than the other in the same period. For instance, admit the other vessel shall deliver 200 tons in one year;—then the Transit, by carrying three-fourths of it, twice told, in the same time, will deliver 300 tons, in the year; with the further advantage of a quicker return of trade, (the sole spirit of commerce,) having delivered 150 tons in the first six months.

It may be asked, why private merchants have not built after the Transit, since she has proved her capacity as a trader? The answer is clear—The Transit has existed almost during a period of continued war, when, by the Convoy Act, all merchant-vessels are bound to proceed with convoy; or, to avoid it, must sail on the expensive establishment of a private vessel of war. The first circumstance precludes

the advantage arising from dispatch, and quick returns; and the cost of the latter may eat up all pecuniary profit.

In building the Transit, the inventor has to regret the being induced, through convenience and economy, to admit a number of elm timbers, which rapidly decayed, and occasioned an early expensive repair. However, all such as had begun, or were likely, to decay, have been replaced (he understands) by oak timbers; and the vessel is now as firm as ever.

Since the Transit has been altered, and turned into a vessel of burthen, being frequently loaded two feet deeper than her sailing-trim, as established by the inventor, it is not to be supposed she has sailed either so fast, or made so good weather as previous to it.* Notwithstanding this, she has performed some remarkable passages, and even voyages,

* Seamen having no true criterion by which to judge of the force of the wind, are led to regulate their ideas of its strength by the good or bad weather which their vessel makes: it is not unusual, therefore, to meet much difference of opinion on this subject. Thus, one person, from on board a deep-laden uneasy sea boat, will relate about the tremendous gale they experienced on such a day; while another, from on board a light and easy sea-boat, will pay little regard to the very same gale of wind.

while other vessels have remained wind and convoy bound at Portsmouth.

Viewing all the circumstances here related of the *Transit's* performance, her sailing with the *Osprey* is the only fair criterion by which to judge of her superiority for despatch. On this cruise, the inventor had given his vessel the nearly equal trim of ten feet ten inches. He certainly could have wished it had not exceeded ten feet six inches, which he believes to be her swiftest sailing-trim, consistent with the other requisite properties.

On the voyage to Lisbon, she sailed with the cabins nearly empty, at the draught of ab ut eleven feet four inches; and since the cabins have been thrown into the hold, she has been sailed at the draught of twelve feet, and more.

Had the inventor been so fortunate as to have met employ for the Transit, as a despatch vessel, to bear her sailing expenses, and had been permitted to sail and trim the vessel to his mind, it would have given him the most fair opportunity of shewing the world the greatest celerity of the Transit; which, as yet, he believes, has not been shewn to the utmost.

It is natural for the reader here to inquire —How is it that Mr. Gower's system should

remain so long neglected by public bodies?—The precise answer is certainly difficult:—assiduity has not been wanting, for the inventor has frequently made it a point to inform the First Lords of the Admiralty, and all public bodies interested in the system, that such a vessel as the Transit is in being; and personal malice, he fully trusts, has had no share in preventing the dissemination of his system. It is to be concluded, therefore, that prejudice, misguided opinions, want of interest, and want of good fortune, are the only obstacles to its complete establishment.

The inventor cannot conclude this account of the Transit, without again returning his grateful thanks to his kind friend Mr. John Blades the managing owner, and to those subscribers who liberally supported the undertaking.

Certificates and Letters of several Masters of Merchant-Vessels, who sailed out with the TRANSIT *to Lisbon.*

N° I.

WE, the undersigned masters of merchant vessels, do hereby declare, that we sailed from Torbay on the 10th of September, 1801, in company with the newly-constructed four-masted vessel TRANSIT, bound out with the Portugal and Mediterranean convoys, under the protection of the Triumph, of 74 guns, the Hydra, Solebay, and Hind, frigates:—and we do further declare and certify, that the TRANSIT was remarkably *easy* in the sea, when compared with other vessels, and appeared to be sailing perfectly *dry*, at a time when other vessels were rolling deep, and shipping much water:—that the TRANSIT worked in a very superior manner—was more weatherly—and would sail faster *upon a wind* than either of the frigates, and even *before the wind* would sail with the HYDRA, which was considered as the fastest sailing frigate of the convoy.

Signed by the Masters of the following Vessels:

Ships.	Captains.
SWIFT	*George Straker.*
INDUSTRY	*Thomas Green.*
GARLAND	*Joseph Saunderson.*
JOHN AND ELIZABETH	*John Haywood.*
SARAH	*Thomas Pears.*
FLANDERS	*Richard Mitchell.*
POLLY	*Samuel Whiley.*
COUNTRYMAN	*John Spence.*
JANE	*Dominick Mongiardin.*
FRIENDSHIP	*William Davenport.*

N. B. The Transit had fifty tons of *shot*, immediately in her bottom, and was otherwise loaded beyond her sailing-trim.

(Signed) W. LISTON.

Lisbon, Oct. 29, 1801.

Observation: by R. H. Gower.

Independent of the fifty tons of shot, the Transit had five tons of iron kentledge, thirty tons of saltpetre, and five tons of other dead weight, making in the whole ninety tons of dead weight, nearly half her burthen, immediately in her bottom. Any round-shaped vessel, with the same proportion of dead-weight situated equally low, would have rolled so intolerably, as to render the vessel unsafe.

N° II. *Certificate of Capt. Henry Warrington.*

"THIS is to certify, that in a voyage from England to Oporto, I was in company with

the four-masted vessel Transit, for ten days; for which period, as the ship I commanded was stationed on the same side of the fleet, I had an opportunity of particularly observing her, and remarked she was always under very low sail, comparatively less than the men-of-war; —appeared to be an excellent sea-boat, as when the merchant vessels, and even the ships of war, were labouring and rolling very deep, the Transit's motion was gentle, and such as I am confident could not strain her in the least. I had an opportunity of being on board her tiwce or thrice, when there was a considerable swell up, and I then considered that her motion was more easy than the largest-sized ship—of this I feel competent to judge, as I was in the East-India service nearly fifteen years. On her passage I was gratified with a proof of her great superiority in sailing, as she had a trial with the Hydra frigate, and gained a decided advantage over her—the wind was quartering:—the Hydra had every sail she could possibly set;—the Transit had her larboard studding-sails set. My remark in the Log-Book of that day, is— "The four-masted vessel, Transit, beat his Majesty's fast-sailing frigate, the Hydra." I was convinced of her amazing weatherly property when the fleet turned out of Torbay, she being the last vessel under way:—in five

tacks, two of those short ones, she was far to-windward of the whole convoy. I feel proud in stating these facts, and in giving my testimony to what I consider as a very great improvement in Naval Science.

"HENRY WARRINGTON,
"Master of the Ship *Harmony*."

Bristol, Feb. 1, 1802.

Observation: by R. H. Gower.

On turning out of Torbay, many of the vessels did not effect their purpose, after making from fifteen to twenty tacks.

N° III. *To Captain Gower.*

Bombay, July 4, 1803.

"DEAR GOWER,

"SINCE my return to Bombay, you can form no idea how I have been plagued to give an account of your charming little vessel. Several gentlemen have wished to build after her; but not having a plan, it is at their particular request I now write to you, and shall think myself exceedingly obliged if you will send out her plan; also a view of her rigging—as one gentleman in particular wishes to build after her, for the Bassora trade, which she will answer for charmingly, as well as bringing the

packets with expedition. Any of your India friends will take charge of it. Address it to John Fell, Esq. Civil Service, Bombay—in the event of my absence. I now command the *Candidate*, a ship of 700 tons, and am doing very well.

"Yours, very sincerely,

"ANDREW FELL."

Observation: by R. H. Gower.

Captain Fell came to Lisbon in the command of a Portuguese East Indiaman; and sailed home to England as a passenger on board the Transit; of course he speaks in her praise from *experience.*

N° IV. *From Mr. Green, one of the present Owners of the Transit—to Allen Chatfield, Esq. of Wimbledon.*

New Broad Street, Jan. 22, 1803.

"SIR,

"I HAVE enclosed two or three letters we received from Captain Muirhead, at different periods of the voyage, by which you will observe the Transit seems to answer the expectation of the projector, Mr. Gower, as to every material point. These letters were written for our own private information, and by a person who never had any connexion or acquaintance

with Mr. Gower, to influence his statements. I can only add, that the gentlemen who purchased the vessel are so well satisfied with her, that they are at this moment putting a quarter-deck, or rather a poop, to her, and have prepared a cargo, with which she will be sent off again for Constantinople, as soon as the carpenters have finished. She lies in Mr. Young's dock, near Globe-Stairs, Rotherhithe, and can be now viewed to advantage by any person desirous of seeing the form of the bottom. For your government, I expect she will come out of dock in about a week's time.

"I am, with respect,

"Sir, yours obediently,

"J. GREEN."

"P. S. Captain Muirhead has just called, and I have desired he will add a few lines confirming the account given in his letters."

N° V. *To Allen Chatfield, Esq.*

London, Jan. 22, 1803.

"SIR,

"I BEG leave to inform you, that during my late voyage in the Transit to Constantinople

and Smyrna, I found her to answer Captain Gower's Prospectus in every respect. Found her remarkably weatherly, and very easy in a gale, several of which we experienced in our homeward passage. I can only assure you, I am highly pleased with her; and to add to that satisfaction, we did not see a ship or vessel during our voyage but that we always beat.

"I am, Sir,

"Your most humble Servant,

"A. MUIRHEAD."

"P. S. I generally found, in working up the Mediterranean, with a commanding breeze, we gained easting, with a dead wind, from sixty to seventy miles by the chronometer, every twenty-four hours!"

The three following Letters were inclosed with the two foregoing:

N° VI. *To Messrs. St. Barbe, Green, and Bignell.*

Transit, Constantinople, Oct. 18, 1802.

"GENTLEMEN,

"I HAVE much satisfaction in informing you of my arrival here, on the 30th ultimo,

after a very long and tedious passage, owing to contrary winds and calms. However, I was convinced, from the weatherly qualities of the Transit, that no ship on the eve of departing for this place, when I left England, could be near me, without some untoward circumstances.

"I got a pilot on board off Milo, on the 8th of September, and from thence we had strong winds from N. E. to N. N. E. However, we beat up, and anchored under Point Berbus, a little below the Dardanelle Castle, on the 22d of September;—we found here thirty or forty sail of merchantmen, at anchor—some of them had been lying nine or ten weeks for a wind. I flattered myself I could beat the Transit through the Strait, but found it impossible. On the 24th of September, I forwarded an express, by the English Consul at the Dardanelles, to Mr. John Prior, informing him of my arrival, and that he might expect to see the Transit the first spirt of westerly wind. However, I had the satisfaction of announcing my own arrival, having arrived two days before the express, or any vessel or country boat whatever.

"From Tenedos, we passed more than 100 sail of different nations, and there are not more than fourteen of them arrived.

"By being first up, it enabled us to discharge immediately. We got all out on the 7th instant, and should have been much sooner but for the Jews' holidays.

"It is pleasing for me to inform you, that all the cargo turned out in the same good state as when received, except one of the canisters of sugar, which unfortunately happened to be under a leak in the deck, which has consumed about one-half of it. I have taken on board about forty tons of ballast, and now only wait for some box-wood, which I hope to receive to-morrow, and sail the next day for Smyrna.

"The crowds of people of all descriptions that have been looking on board the Transit, are immense. Indeed, I found it necessary to have a guard, to keep them off, when we were discharging.

"With respect to her sailing, I have seen nothing that can touch her *upon a wind*, — her weatherly qualities are so great. *Before the wind*, some of the light polacres ran us hard, particularly two that started from Point Berbus with us. We had but very little advantage of them, until we got the wind at N. E. in the Marmora Sea, when we soon left them, and I believe they did not arrive till two days after us.

"The Transit is remarkably easy at sea—I have not a doubt but she will answer well for the trade.—It is a pity she is so low abaft. In my opinion that appears the only fault.

"I am, Gentlemen,
"with the greatest respect,
"Your obedient Servant,
"A. MUIRHEAD."

Observation: by R. H. Gower.

The reader should recollect, that the Transit was built for *a packet*, to be sailed at a light draught of water, with empty extremities; in which trim, it never appeared to the inventor that she was too low abaft. However, in deeper trim, and with loaded extremities, the case is widely different; and Captain Muirhead's remark, respecting her being too low abaft, is thereby verified.

N° VII. *To Messrs. St. Barbe, Green, and Bignell.*

Transit, Smyrna, Oct. 16, 1802.

"GENTLEMEN,

"I HAD the pleasure of writing to you, on the 10th instant, from Constantinople, informing you I was then on the eve of sailing for this place, which I did on the 12th, and arrived here yesterday, after a tolerable passage of seventy hours. We passed the chief

part of the ships which we left at the Dardanelles on our way up. I cannot help mentioning we passed a Dutchman, off Maurimo, from Amsterdam, bound to Smyrna, then out eleven weeks; and the same vessel we passed yesterday, off Fogia, still on her way to Smyrna:—which I could hardly credit! I have this day made a beginning to load, and expect to be complete in all this month, as every thing appears ready for us, and no exertions on my part shall be wanting to take them on board.—Expect I shall write you by next post of my departure from hence.

"I am, Gentlemen,
"with much respect,
"Your obliged Servant,
"A. MUIRHEAD."

Extracts from another Letter.

N° VIII. *To Mr. Green.*

Transit, Sandgate Creek, Dec. 30, 1802.

"SIR,

"WITH respect to my opinion of the *Transit*, I like her much. The manner in which she is rigged is very complete and convenient, for she can be reduced to her fore-and-aft

courses in a very short time. Indeed, she has been well tried this passage, being frequently put under our first and third courses reefed, and reefed fore-stay-sail, when I am sure she did not make more than two and a half points lee-way.

"A vessel of this description must be kept always in motion. She will then, with ease, make two voyages in the year. Such passages as I have experienced this voyage, are not always to be expected.

"I have every reason to imagine the fruit is in excellent order.

"Sir, with great respect,
"Your much obliged Servant,
"A. MUIRHEAD."

N° IX. *To Captain Gower.*

Transit, Gravesend, Feb. 21, 1803.

"SIR,

"I must beg pardon for being so long forwarding the enclosed certificate, but really, the extreme hurry I have had since the Transit was at home, is the sole occasion.

"We got to Gravesend last evening; and, as usual, beat every thing. We came from

Deptford in three hours and twenty minutes, although we had but light winds, and several reaches to beat through, the wind being so far Southerly. Therefore, I am in hopes the alteration will not affect her sailing.—I hope you will excuse my haste.

"And am, Sir,
"with great respect,
"Your humble Servant,
"A. MUIRHEAD."

The foregoing Letter contained the following Certificate:

N° X. *Certificate of Captain Muirhead, and his Officer, Mr. Liston.*

"THESE are to certifiy, to those whom it may concern, that we, the undersigned, have performed a voyage to Constantinople and Smyrna, in the Transit, during which we experienced much bad weather, with contrary winds, particularly on the homeward-bound passage. Notwithstanding, we always found her remarkably easy and lively in the worst of weather; and, to add to that, we have the satisfaction to affirm, that we have beat every

ship or vessel we saw during the said voyage, and in our opinion she answers to all the good qualities, as mentioned in the above Prospectus.—(*Vide Prospectus, page* 13.)

"A. MUIRHEAD—*Commander.*
"WILLIAM LISTON—*First Officer.*"

Given under our Hands, this 5th Day of January, 1803.—London.

OBSERVATIONS

ON

THE LOG AND LINE,

WITH A

DESCRIPTION OF VARIOUS INSTRUMENTS

FOR

MEASURING A SHIP'S WAY;

AND AN ACCOUNT OF

R. H. Gower's Patent-Log.

H

OBSERVATIONS,

&c.

The ability and industry of theoretical and practical astronomers having made us acquainted with the shape and geographical admeasurement of the earth, it has excited, and become of importance, to the navigator, to be informed of the *absolute distance* which his vessel has gone over its surface; for by means of this *distance*, and the correct course, the seaman may calculate the position of his vessel, from time to time. But, the fluctuating nature of that portion of the surface of the globe over which the seaman travels, has opposed the application of the inventive faculties, and has hitherto precluded ingenious men from producing this desirable object in perfection. If, however, we seem precluded from ascertaining the *absolute distance passed over the surface of the earth*, which comprehends the mixed distance resulting from the ships-way and current, yet we are by no means prevented from

ascertaining the distance passed over the *surface of the sea:* and provided the sea be stationary, as mostly is the case, it is the same as to be possessed of the *absolute distance passed over the surface of the earth.* With this intention, the infancy of navigation produced the Log and Line, which is a simple, but rude, instrument, and very inadequate to the purpose: for, admitting even that the Log-line be justly proportioned to the geographical mile, yet the instrument is, nevertheless, inaccurate, from several other causes. The first cause is, that the log does not give the direct distance sailed, but the distance as increased by the yawing of the vessel:*—the second is occasioned by throwing the Log-float into the eddy-water, astern of the vessel:—the third, by the coming home of the Log-float towards the vessel:—the fourth, by the blowing away of the Log-line to leeward, when hove from a high stern, with a strong quartering wind:—and, the fifth, by adapting the measure of the Log-line to so minute a portion of the hour, as a half, or a quarter, of a minute. The second, third, and

* All Logs, of whatever kind, are subject to this error; but, while the yawing of the vessel is confined within the limits of two points, the loss occasioned to the direct distance by this deviation, is very immaterial, being nearly in the ratio of the versed sine of half the extreme angle of the yaw.

fourth errors, depend very much upon the heaver of the Log; and may, by attention on his part, be rendered very immaterial; but the fifth requires such extreme quickness in the heaver, and nicety in noting the time, particularly when the vessel is sailing so fast as to compel the usage of the quarter-minute glass, that accuracy becomes a matter of accident. For example, when the rate of sailing exceeds ten knots, we cannot place reliance on the Log and Line, to the amount of a knot on either side the truth.

At these times, therefore, the Log can be viewed in no other light, than as an assistant to the officer, to estimate the distance with greater accuracy than a guess. But, as the principal error of the Log and Line arises from using so minute a portion of time, it may be asked,—why not adjust the measure of the Line to one, two, or even three minutes of time, to prevent the evil? To seamen, the reason is obvious: they are aware that the quantity of Line, which must in such case run out from the ship, would have so great a hold of the water as to be carried all away, immediately on its being stopped. Thus, were the line adjusted to three minutes of time, at a rate of ten knots, the amazing quantity of half a mile of line, or 3045 feet, would be run out; the loss of

which would be of serious moment. But, at the same time, were it possible to haul such a length of Line on board entire, the labour attending it would preclude seamen from the use of such an instrument. Indeed, so much is thought about the trouble of heaving the Log, even in its present proportions, that on board merchant-vessels, where there are few hands, it is hove but once every two hours. Were any instrument, therefore, contrived to perform this duty, with less trouble and assistance, though with no greater accuracy than the present Log, it would allow all vessels the advantage of heaving the Log more frequently.

The imperfection of the Log and Line has induced navigators, who sail long voyages through tropical climates, and who are guided by astronomical observations, to pay but a slight regard to the distance given by the Log. The complete marine astronomer, with his chronometer, sextant, and lunar-tables, and with the sun, moon, and stars, open to his view, may, for the time, feel independent of the Log; but, let us ask—Of what avail is it that he is acquainted with the motion of the heavens, if the sun, moon, and stars, be ever blotted from his sight?—This is a circumstance by no means unusual in temperate climates, for days together, particularly *on the*

approach to land; at which time the navigator has the greatest occasion for their appearance. At periods like these, even the astronomical navigator must pay attention to the Log, or run the greater chance of blundering his ship on shore,—to mark an indelible stain on the exalted character of an able navigator. Let him, therefore, not affect to despise the Log, or any attempt to improve that mode of ascertaining the rate of sailing. It unfortunately happens, that astronomical navigators are but few, compared to the mass; and they, for the most part, are confined to the higher services; the smaller merchant-vessels being more frequently navigated by seamen, whose good conduct has advanced them to command, from being fore-mast men. The nature of their education may, therefore, for the most part, preclude this numerous class of navigators from reaping the advantages of astronomy. But, granting that information was not wanted to perform the necessary problems,—yet their pay and emoluments are not equal to the expensive purchase of books, chronometers, and sextants.—Again, admitting even these instruments to be in their possession, the few persons of this description to be met with on board small vessels, will scarcely allow of sufficient avocation from the duties of a seaman, to fol-

low astronomical navigation; and, without the assistance of several persons, few observers are equal to the taking all the observations necessary to attain the longitude. Certainly, a quick observer, with a stop-watch, and two quadrants, set ready to take the altitudes, may measure the distance of the objects, stop his watch, and then catch their altitudes, sufficiently near to effect the lunar problems; but men of such ability are seldom to be found on board small vessels, where the pay is of necessity small. All circumstances, therefore, considered, unless a more simple solution than the lunar method should happily be discovered to ascertain the longitude, the more numerous class of navigators must be content to place their dependence, in deep water, on the *Compass*, the *Meridian Altitude*, and the *Log*. Any improvement, therefore, of the Log, the most imperfect of the two instruments, is deserving the patronage of Government, and of great commercial companies.--Without such assistance, improvements in navigation are not readily introduced; for, although the commander of a ship may wish to apply them, yet he expects the cost should rest with his owners; but the owners, regardless of navigation, are too strongly impressed with the desire of economy to allow them. Indeed, the salutary

use of the best steering-compasses, are even denied by many owners.

To cure this pernicious oversight, so disastrous to the lives of seamen, and injurious to the insurer,—it would be policy in the underwriters, to decline all risk on such vessels as were not liberally found in charts and instruments of navigation.

In proof of the little attention that is paid to the navigation of small vessels, the author begs leave to relate the following anecdote:

In the year 1780, he sailed out to the East-Indies, with a large convoy, commanded by Commodore Johnson.—In the fleet were several transports and victuallers, who, unacquainted with navigation and the nature of so distant a voyage, were poorly provided with charts and instruments. So much was this the case, that one of them, well known to our second officer, was actually possessed only of an *unadjusted quadrant*, and a *Moor's Navigation;* without a single chart, save the little map contained in that work, comprehending the coast between England and Madeira.

For an instant, let us imagine the state of a vessel so circumstanced, and alone—adrift in the pathless ocean—the centre of an extended circle—without a guide to direct it, or a real object to pursue!—Hope views

the wished-for land in some false-resembling cloud,—the ship bears-up, with rapid course, to join the welcome shore:—but, alas! she follows it in vain! for soon the gladdening view, losing itself upon the sight, is all dispersed in air, leaving the vessel to every appearance where she was,—yet still within the centre of a fleeting circle, whose boundary can never be approached!

The state of this unguided vessel, in the year 1780, was surely *inferior* to the one commanded by the reflecting mind of Christopher Columbus, as far back as the *fourteenth century!*

The author cannot claim any intimate acquaintance with the regulations of the Royal Navy; but, if he be not misinformed, the general state of *navigation*,* on board his Majesty's ships, has no title to *pre-eminence*. It is understood to be the *duty* of the *master* to navigate the ship; but, as masters, for the most part, are promoted from the merchant-service, for their ability and expert seamanship, it is not to be expected that their information, as *navigators*, can exceed the information of the service from whence they came; particularly at first, however it may afterwards be improved.

* This term is distinct from *seamanship, discipline,* or *fighting.*

Independent of this circumstance, the master of a ship is subject to every call, and therefore has not sufficient leisure to follow nautical astronomy; and his pay, too, is by no means adequate to the purchase of the best constructed instruments, or the further purchase of charts for every quarter of the globe. His Majesty's ships are thus but scantily supplied with such *instruments of navigation* as are not immediately found by the Government; and they may occasionally be met with under circumstances not very superior to the poor victualler, before related.—Surely, then, the *present state of* NAVIGATION *in the Royal Navy*, is a subject worthy the serious consideration of the Government!

To navigate a vessel with *correctness*, is employment sufficient for the whole mind:—the propriety, therefore, of appointing men of broad education, having an intimate acquaintance with the theory and practice of nautical astronomy, to perform this immediate duty, is manifest.

These persons being provided by Government with the best instruments, and charts of the known world, should be employed from time to time, in seeking the latitude, the longitude, and the variation, by such means as the state of the heavens will admit; so that

they may, at all hours; be capable of producing the ship's place to their Commander, with *correctness.*

The study of navigation, (on such a plan,) being introduced *generally* into the Royal Navy, will not only give safety to the ships, but will also have a tendency to correct the errors of the *Cockpit;** for the *navigator* having occasion to select young men to assist him in making the necessary observations, will create so great a zest for nautical astronomy, in the younger officers of ships, (particularly if *sanctioned* by the Captains,) that the *Cockpit,* too frequently the dark abode of indolence and dissipation, will be illumined by the blaze of Art and Science.

To make a perfect Log, the first idea, probably, that presents itself, is the producing a line equal to the length the ship has sailed:— a circumstance not easily to be managed. An *imaginary line* may, however, be collected, on the following principle:

If a hole were made in the bow of a ship, beneath the surface of the water, the water would

* "*Cockpit:*" the mess-room of the midshipmen, which, being situated in the orlop-deck, has not the comfort of *daylight,* and is consequently a hindrance to *correct vision.*

pass through this hole into the ship, in proportion to her rate of sailing, augmented by the quantity forced in from the pressure of altitude.

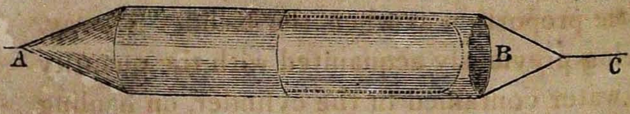
Now, instead of having a hole in the bow of the ship, if a vessel, as a cylinder, with a hole in its front, were drawn after the ship, the water would pass into the cylinder, in proportion to the sailing of the ship, increased by the pressure of altitude arising from its depth; which, being taken from the body of water found in the cylinder, at any period of time, the remainder would be proportioned to the distance sailed.

The prospect of being able to collect a thread of water, equal to the distance sailed, in this simple manner, was highly pleasing, as it seemed to offer the fairest hope of effecting the wished-for instrument.—However, on further reflection, several things occurred to render such an instrument inconvenient, at least, if not totally useless; and the principle was, therefore, not put to the test of experiment. In the first place, the instrument would have needed an air-pipe, to give vent to the included air whilst the water entered at its front; secondly, it would have required to be maintained at the same depth beneath the surface of the water, for the sake of preserving the pressure of altitude uniform; thirdly, the

small aperture in front would have been ever liable to be choaked-up with the least floating substance; and, lastly, a quantity of lead would have been necessary, to have sunk the empty cylinder. The idea, therefore, of effecting a Log upon this principle, had subsided for years, until accidentally in the year 1795, when, the subject being resumed, it struck the author that the ship's distance might be ascertained by the *running out, or loss*, of a similar thread of water, on a plan which avoided the inconveniences that would have attached to the former Log.

Being satisfied with this immediate improvement, an instrument was constructed, according to the annexed representation.

Description and Elucidation of the Water-Log.



AB represents a brass cylinder, open at the front end B, and terminating in a cone, at A; through the apex of which is perforated a very small hole, in an Agate. Now, if this cylinder be immersed in the water, and be drawn forward, by the line BC, from the ship, it is clear that the water will pass out through the

aperture A, with a velocity proportioned to the sailing of the ship; consequently, to be acquainted with the length of the thread, or body of water, which has passed through the aperture, is, in effect, to be possessed of the distance sailed.

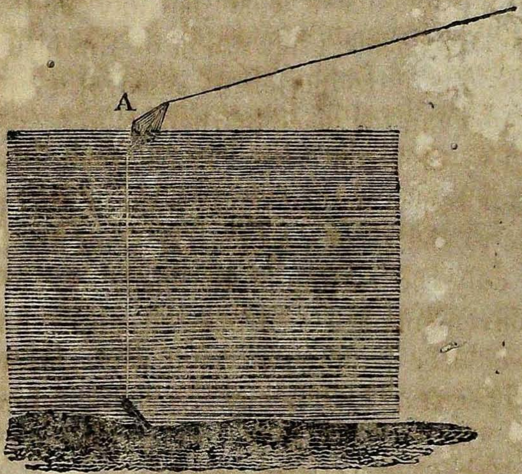
This circumstance was accomplished by the following contrivance: the centre of the cylinder was made to unscrew, and within the cylinder was fitted a thin oblong bladder, as represented by the dotted curved line. The cone also was formed to unscrew, for the convenience of filling the bladder and cylinder with clear water, when held in an erect position. Now, when the cylinder is filled, and drawn after the ship, as before described, it is very clear that the external water will press upon the outside of the bladder, and force the internal water through the aperture, in the same proportion as when the bladder is away. Being previously acquainted with the quantity of water contained in the cylinder, on hauling it up we may also inform ourselves of the quantity which has escaped through the aperture; because the quantities may be subjected either to weight or measure.

Experiments were made, on a small scale, with the instrument thus represented, very much to the satisfaction of the inventor; but,

as its size allowed it only to measure distances within the mile, he adapted a scale to it, in such a manner, as to convert the instrument into a Rate-Log, proportioned to three minutes of time. The instrument, so improved, he took with him to India, and used with great success; but he was prevented the more frequent use of it, from the rotting of the bladders, with which he was but scantily supplied. However, this inconvenience very possibly might be avoided by some preparation of the bladders, or by the introduction of some other pliant substance in the place of them.

The objection that occurred to the inventor respecting the application of this principle to the purposes of a *perpetual* Log, was not only the rotting of the bladders, but the inconvenience arising from so large a cylinder, as would be required to hold sufficient water for a *perpetual* Log, of any considerable length.

Description of a Log to be used in Shoal Waters, which gives the absolute Distance *sailed, and the Course made good, as compounded of the Ship's Way and Current:—a simple Instrument, which will be found extremely useful to the Marine Surveyor, and to the Navigator, in his Passage along Coasts, or through Shoals and dangerous Straits.*



The annexed figure is a representation of this Log, when actually in use. A is a double cone, about four inches diameter, and eight inches long; which, to a seaman, bears resemblance to a nun-buoy. This cone is hollow, made of brass or copper, and through its axis is soldered a tube, sufficiently large to carry a Log-line with ease; each end of the tube

being rounded off every way, so that the line may pass freely over its edge, without meeting any chafe or impediment. To the Log-line, as usually marked, or fifty feet nine inches per knot to a glass of thirty seconds, let an additional quantity of stray-line be added, the end of which is to be passed through the axis of the cone, and is then to be attached to a long-lead of about three or four pounds weight. Being thus prepared for use, the lead and cone are to be thrown over-board together, when the stray-line passing freely through the cone, will allow the lead to reach the bottom, and anchor the cone perpendicularly over it, as represented in the figure. The stray-line being out, turn the glass, and proceed in every respect as if heaving the common Log. Previously to hauling-in the line, take the bearings of the cone, and the opposite point is the course made good, as compounded of the ship's way and current.

The usage of this Log will scarcely create any additional labour; for the shape and floating capacity of the cone will cause it to trip lightly over the surface of the water, whilst hauling it on board, particularly if the lead be not too weighty for the cone.

Should the practitioner not be provided with a cone, a light circular piece of board,

about ten inches over, and well painted, having a hole near to its circumference for the stray-line to pass through, may answer the purpose as a substitute.

The ingenious and indefatigable M. Bouguer has proposed a Log, whose principles bear resemblance to the one we have described, for the purpose of ascertaining the *absolute distance passed over the surface of the earth*, as compounded of the ship's way and current; and, were it a fact that water remained unaffected by currents, at the depth of forty or fifty fathoms, such an instrument might be successfully applied. However, the following experiment evidently proves that under-currents do exist, even at this great depth.

At sea, in calm weather, it is no unusual practice to try the current, by attaching a pitch-pot to the deep sea-line, which being lowered down from the bow of a small boat into the sea, to the depth of fifty fathoms, where the water is supposed to be stationary, will have the effect of securing the boat to this stationary water; consequently, if the water passes the boat, now riding at anchor, it gives the semblance of a current at the surface, which may be ascertained by heaving the Log. Was the current thus found *absolutely* at the surface, its amount and direc-

tion being worked with the days-work, as a course and distance, it should cause a perfect agreement between the latitude by account and observation; but so far is this from being the real case, that, frequently, to cause a perfect agreement, the current thus found must be totally rejected. This circumstance, it is presumed, can only be accounted for by supposing an under-current, and may be thus elucidated: —Let us suppose that the water, at the surface of the sea, perfectly tranquil, but at the depth of fifty fathoms, in the region of the pitch-pot, is running North, at the rate of a mile per hour: it is evident that the pitch-pot, moving along with the under-current, will draw the light boat over the surface; and the people in the boat, supposing her stationary, will say, "the current passes her, running South, a mile per hour." Consequently, to have allowed this imaginary Southern current, would have caused the latitude by account, to vary from the observation, by its whole amount.

The author having repeatedly found that the current, thus given, was contradicted by the observation, is of opinion, that the safest way of proceeding is to reject this experiment, since, instead of correcting, it may absolutely lead us into, error.

Lately, at the request of Mr. Gilbert, op-

tician, in Leadenhall-Street, the author was induced to alter and improve a Log invented by him some years ago, the objection to which was, its size, and its being obliged to be attached to a float-board, which rendered the instrument far more cumbrous. The float, in its present state, is done away altogether, and the instrument is rendered small and compact, as will appear by the following description:

A Description of GOWER'S PATENT-LOG, *sold by Messrs. Gilbert and Sons,* N° 148, *Leadenhall-Street.*

AB fig. 1, plate 4, represents a spiral, having four vanes, or leaves, which are firmly fitted on a tubular axis, for the sake of lightness,—the spiral being capable of performing a certain number of revolutions, when drawn through a certain space, in water. A, on the axis of the spiral, is a worm, nicely formed to play in the teeth of two concentric wheels E, which appear as one, from the one covering, completely, the other. These wheels are so contrived, as to register the number of turns made by the spiral, and taken together, are termed the register. The spiral and register being thus disposed, are fixed to move in a frame of brass, as represented by fig. 2, which is a profile of the instrument, consisting of the following parts: BC is a tube, which

surrounds the spiral, and serves to protect it from injury. A. B and C are hoops; the hoops B and C being secured to the ends of the tube. Each hoop has four slit uprights attached to it, placed at right angles to each other, as shewn by fig. 3, which is a representation of the front hoop C, with its uprights D. D. D. D, the same letters also refer to such of these uprights, as can be seen in fig. 2. The hoops A. B and C, fig. 2, are so placed, that the uprights form four right-lines, into the slits of which are screwed four flat pieces of brass; only two of these flat pieces of brass, as E and E, can be seen; the others, which are less, standing edgeways to the view, in the direction of the dotted line. These pieces of brass, or *fins*, cause the instrument to move steadily in the water, and prevent it from turning round: they also are of service to strengthen the instrument, in the direction of its length.

One of the larger fins has a semicircular piece cut out of it, to receive the register, the axis of which is secured to a plate of brass, screwed on to this fin, at the back of the register; F F, is a thin semicircle of brass, screwed to the fin on this side, to cover the teeth of the register-wheels.

The end hoops of the instrument A and C, have each a thin cross bar, placed edgeways to the current, and in a line with each other,

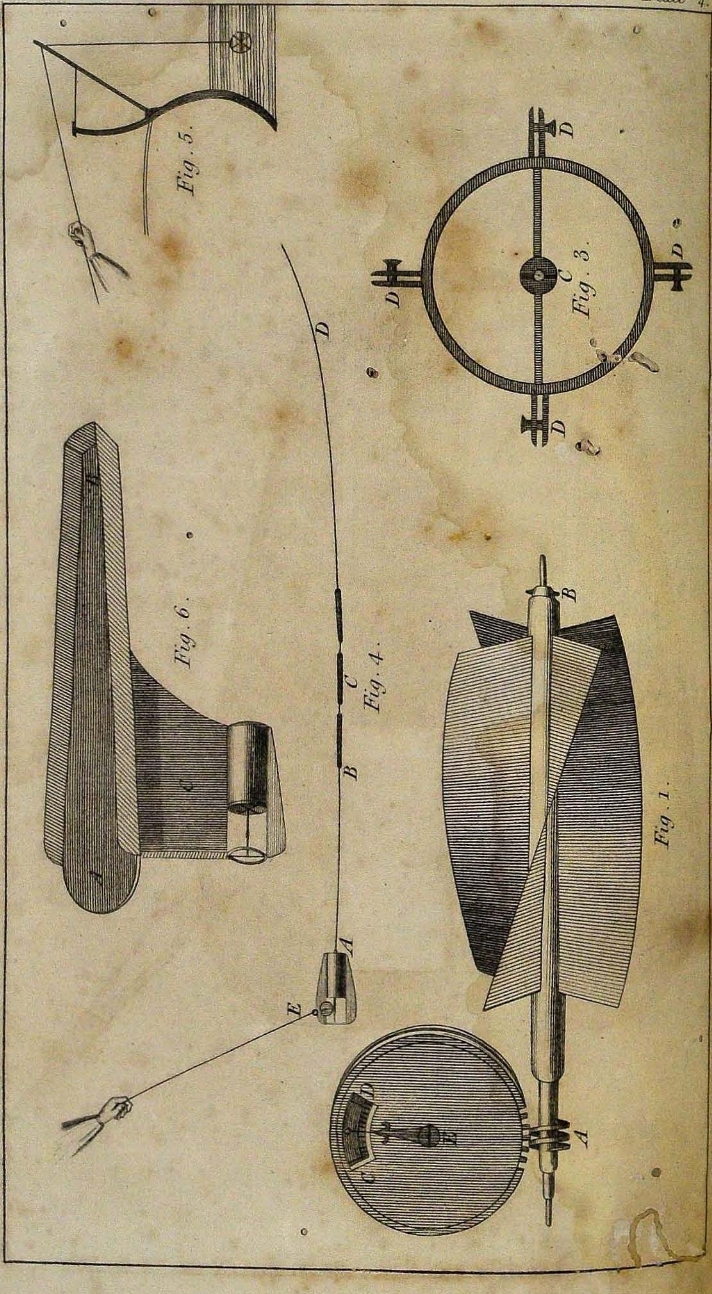


Fig. 5.
Fig. 6.
Fig. 4.
A
B
C
D
E
Fig. 3.
Fig. 1.

Fig. 2.

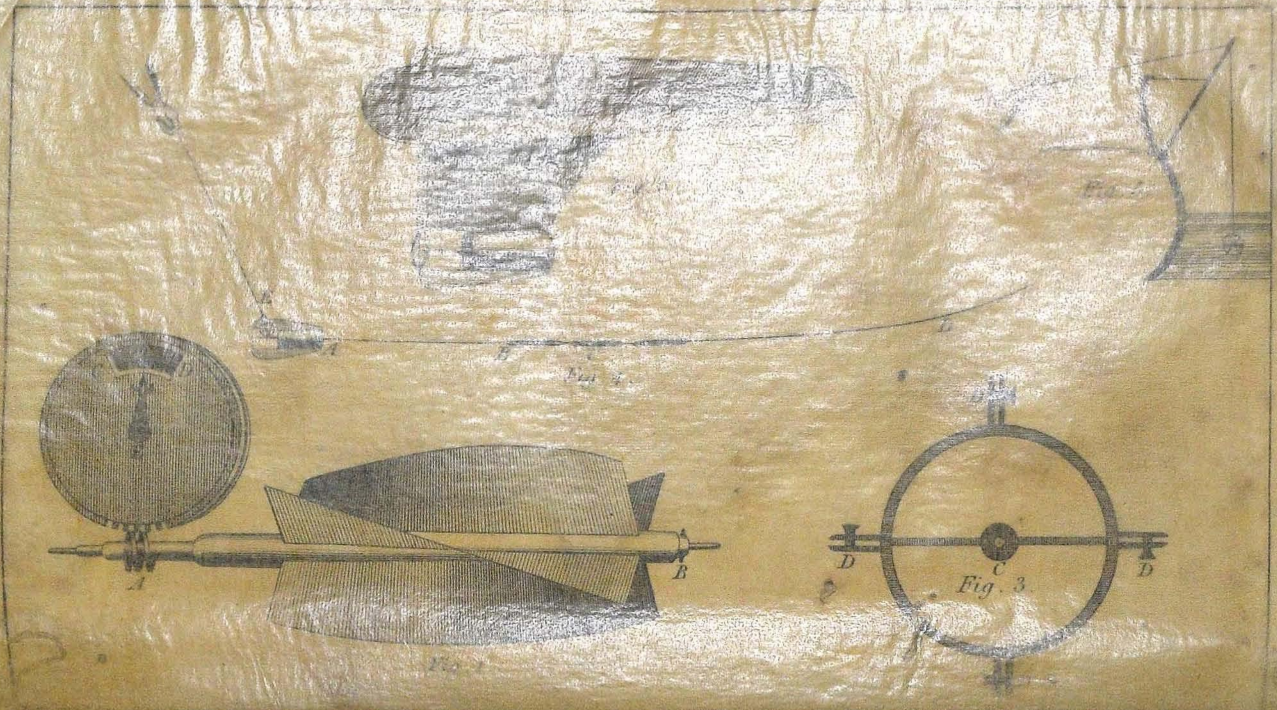

A
B
D
C
D
Fig. 3.

Plate 4.

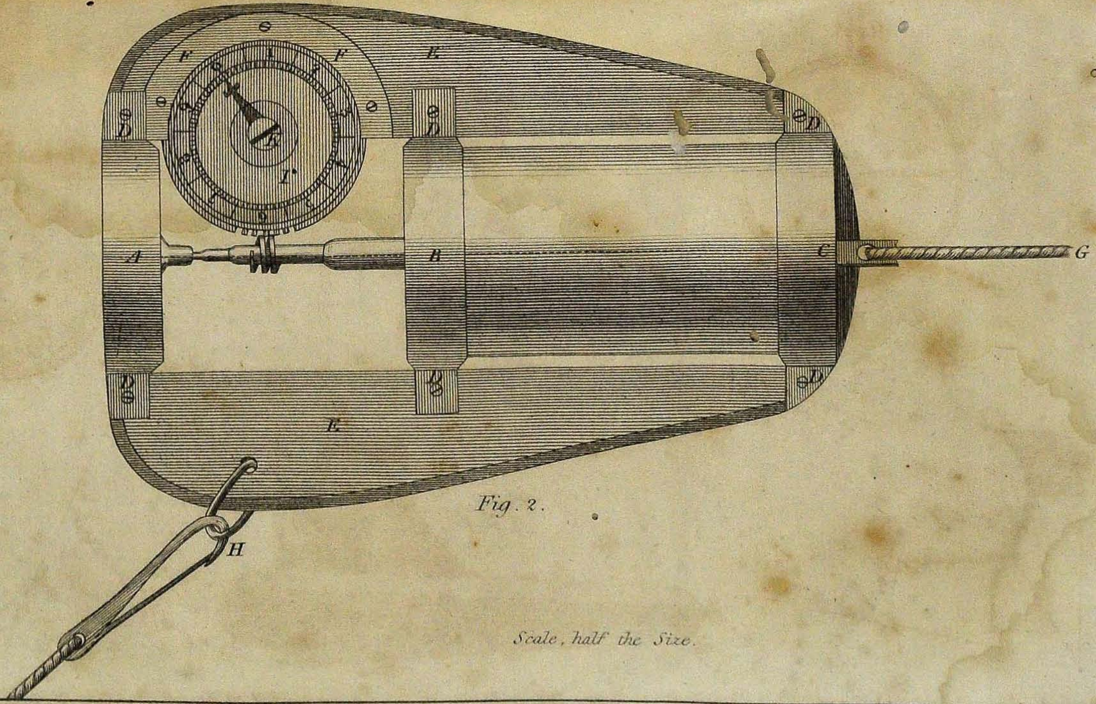


Fig. 2.

Scale, half the Size.

J. Lodge sculp.

so that the course of the water through the tube may meet the least possible interruption. The centre of these bars are increased, to admit of holes to receive the pivots of the spiral, as represented by C, fig. 3, which is an inside view of the front hoop, with its cross-bar. The increased centre of the front bar is made to project forward, as represented at C, fig. 2, through this projection a hole is drilled to receive the tow-line, CG.

As the spiral moves extremely free, it was necessary to adopt some self-operation, by which the spiral might be secured from the power of the wind, when the instrument was in the act of being taken up, or being withdrawn from the water;—which is completely effected by the following simple contrivance: at B, fig. 1, close to the front end of the tubular axis of the spiral, are fixed two small pins, or studs, diametrically opposite to each other, which, by admitting a trifling play of the spiral, in the direction of its length, may be forced into a notch, cut inside, across the centre of the front bar, as represented at C, fig. 3: this prevents any further motion of the spiral; and the self-operation of the contrivance effects the purpose. The instrument is caused to be drawn up, and let down into the water, by a hauling-up line, which is hooked on to the ring H, fig. 2, at the hinder part of

the instrument. Now, if the print be reversed, making H the upper side of the instrument, it may be readily conceived that, while the instrument continues to be suspended by the hauling-up-line, its front will hang drooping; which position will admit the spiral, by its own weight, to force the studs into the notch, where it will remain secure. But immediately the instrument is immersed and drawn forward, the water will press back the spiral, and thereby releasing the studs from the notch, will leave the spiral free to revolve.

To protect the instrument from injury, by softening any blow it may receive from incautious usage, the edges of the four fins are bound round with thick leather, which is represented by the dark edging round the two represented fins, E and E, fig. 2.

The Principle of the Patent-Log.

The moving power of the instrument is a spiral, consisting of four vanes, or leaves, each vane being a spiral curve, passing through the quarter of a circle in a certain length. The perfect shape of this spiral is generated by a rectangular cross, conceived to be moving angularly through the space of a quarter of a circle; while, at the same time, it is dropping in a direction perpendicular to the plane of its angular motion. Since, then, the shape of this

spiral is so generated by a cross, it follows, that, to be perfect in shape, it must be capable of being passed perpendicularly through any rectangular cross cut in a plane of thin brass or copper. This rectangular cross, cut through the plane of brass, will enable us to give a clear idea of the quantity of rotatory motion which such spiral must of necessity make, on being drawn a certain distance, through a resisting medium, in the direction of its axis. For instance, if the spiral be suspended by a thread, at one end of its axis, and be drawn up perpendicularly through the cross, in the plane of brass, which now resembles a perfectly resisting medium, it evidently will make one quarter of a revolution in passing its length through the cross, and of course will make one complete revolution, in passing four times its length through a perfectly resisting medium. Such being the case, by adapting the spiral to a certain length, we may cause it to perform a certain number of revolutions in the space of a mile; and, if the revolutions be noted by a register, we shall be informed, from time to time, of the distance which the spiral has passed through a resisting medium, as water, for instance; and we shall thereby constitute a Perpetual Log. The inventor, however, having a strong objection to a *Perpetual* Log, on the score that, if obstructed by

any impediment, the distance sought would be thereby done away without recovery, proposed to apply this *principle* to give the rate of sailing to *three minutes of time*, which would produce twelve times greater accuracy than the common Log, when used with the quarter-minute glass.

By adopting this plan, an opportunity was admitted of removing any obstruction to the motion of the spiral, when the Log may be rehove, to ascertain the rate:—it also did away with the wear and tear of a Perpetual Log, in a material degree.

It may be objected, that a Log of this description will not ascertain the distance run, so completely as a Perpetual Log, on account of the variations in the velocity of sailing.—Granted: this will be the case, if it be hove only once in an hour, and the rate, during the interval, has been various; but, instead of being hove only once in the hour, had it been hove several times, whenever the rate of sailing appeared to alter, (the trouble attending which would be trifling, as there is no length of line to haul on board,) the inventor is clear that the mean of these rates would prove a very close approximation to the absolute distance sailed.*

* *Perpetual Logs*, on this *princple*, may be had of Messrs. Gilbert, opticians, Leadenhall-Street, if required.

In suiting the necessary proportion of line or distance to three minutes of time, a geographical mile is presumed to consist of 6090 feet. Therefore, if a ship in one hour, or sixty minutes, sail at the rate of 6090 feet, in three minutes she will sail 304½, which is the measure of each knot of log-line; and ten knots will require 3045 feet, or half a geographical mile of line. Now, to effect this proportion, by means of the *rate-log*, which is the subject of elucidation, the spiral is to be so adapted to its register, as to move it round in 3045 feet, or ten knots; therefore, by dividing the register-scale into ten parts, each part will represent one knot; and these being sub-divided into ten divisions, each sub-division will represent the tenth of knots.

The division of the knot into tenths, meets the decimal division of the tables of the difference of latitude and departure, and is more convenient than the unnatural division of knots into fathoms.

Description and Elucidation of the Register.

The worm A, fig. 1, plate 4, plays in the teeth of two equal concentric wheels E, turning on the same axis, but independent of each other, although appearing to be one wheel: one of these wheels has fifty teeth, and the

other has fifty-one. Now, as each turn of the spiral will cause the worm to revolve each wheel through the angular space of one tooth, in fifty-one turns of the spiral, the wheel of fifty-one will have completed a revolution; while, at the same time, the wheel of fifty will have completed a revolution and one tooth over, having revolved with a velocityexceeding fifty-one, in the poportion of one of its teeth for each revolution of fifty-one. Such being the case, in fifty times fifty-one, or, which is the same thing, in 2550 turns of the worm, the wheel of fifty will have exceeded, or passed round the surface of the other, one complete revolution. Since, then, the wheel of fifty moves round the surface of the other, which is here made the under wheel, by dividing the inside of the under wheel, as before-mentioned, and cutting a circular space, as CD, out of the upper-wheel, sufficiently large to read off the divisions beneath, by the assistance of a single mark, or engraved hand E on the upper-wheel, we shall be enabled at any time to read off the number of divisions which the wheel of fifty has exceeded the wheel of fifty-one; or, in other words, the rate of sailing, in knots and tenths.

This is a simple explanation of the register, as at first applied: but, as it required the lifting

of the wheels out of the worm, to move back the wheel of fifty, that its hand might be set at the beginning, or zero point, of the divisions,—which was attended with some inconvenience, and admitted the chance of bending the axis of the spiral,—it was judged proper to divide the circumference of the upper wheel, as represented by the register, in fig. 2. Then, by causing the upper-wheel to revolve on the nave of the under-wheel, which projected through it about a quarter of an inch, we were at liberty to affix a thin circular plate of brass, to move stiffly round the nave, by means of a spring socket; which, being set to a particular point, would there adhere, and revolve with the velocity of the under-wheel. The size of this plate is limited by the inside circle of the divisions; and, to prevent its being moved from its position, by any floating obstacle in the water, it is sunk into the upper-wheel, so as to form an even surface with it. On the surface of the plate is engraved a hand or pointer, which is readily put to zero, by setting the thumb-nail against a small stud I, which rises above the plate, and moving thereby the circle round to the required point. As it was necessary that the spiral and register should have an immediate communication, a more appropriate register could scarcely have

been devised. From its simplicity, it is well suited to move under water; and, by standing edgeways to the fluid, it causes but a trifling interruption to its free passage through the cylinder. In a mechanical point of view, it certainly has pretentions to novelty; and, being more generally applicable, may prove highly valuable to the mechanist, in a variety of machinery.

Of the Calculation adopted to produce the proper Length of the Spiral.

We have already explained, that the register is calculated to make a complete revolution in 2550 turns of the spiral; which number of turns are to be performed by passing the spiral through the distance of 3045 feet of water, or half a geographical mile; of course, the spiral must be of such a length, as will admit it to perform 2550 turns in 3045 feet. Now, as the spiral here used will complete one turn in passing four times its length, if we divide 3045 by 2550, we shall have the length, or distance, through which the spiral must pass to complete a turn, *viz.* 14,34 inches, a fourth part of which, *viz.* 3,58 inches, is the length of spiral required to suit the register.

In following this calculation, it has been upon the presumption that the medium,

water for instance, suffers little or no displacement from the friction of the spiral, or resistance to its rotatory motion; but, that it turns as completely to its theory, as if drawn through a medium of stiff tallow, in which it would leave the perfect trace of a four-threaded female screw. It will be found, however, that the spiral has some degree of friction, and as water is more readily displaced than tallow, it will not turn quite so completely to the established theory as could be wished.

Whilst making experiments to ascertain the necessary length of the spiral, it was observed, that when the spiral was simply attached to the register, without a surrounding tube, it required to be rather shorter than pointed out by theory; but that when it was made to turn within a tube, which was necessary to protect it from injury, it absolutely required to be longer than theory.

This circumstance certainly wears a paradoxical appearance; but, when we consider that by attaching the tube to the spiral, with its necessary hoops and frame-work, we thereby increase the magnitude of the instrument, we shall cease to be surprised.—Having increased the magnitude of the instrument, we cause it to displace more water, and to leave a greater *wake*, or vacuum, behind it. Now, to

fill this vacuum, is the office of the surrounding water, which rushes towards it; consequently, the water is drawn through the tube, with a velocity rather exceeding the absolute motion of the instrument; which causes the theoretical spiral to over-rate, and points out the necessity of increasing its length to 3,75 inches.

The inventor has made some hundred experiments on the motion of spirals, in still water, all which have proved to him the necessity of forming the curve of the spiral-leaves theoretically just, and causing them to revolve with the least possible friction. If these circumstances are not attended to, the rotation of the spirals will deviate widely from calculation;—they will also vary their motion materially, when drawn the same distance with different velocities.

To produce the just shape of the spiral, baffled the ingenuity of the mechanist whom I employed,* for a length of time; but still continuing to persevere, he at length accomplished the art; and will now make spirals so completely to theory, that the performance of all are pretty exactly alike. The friction of the spirals is so trifling, that a single blast of the breath, when held in an upright position, will

* Mr. Alexander Grant.

cause them to revolve with considerable velocity. In water, the friction must be still less; for the leaves of the spiral being attached to a a hollow axis, its specific weight is thereby reduced upon an immersion; and, consequently, as it then presses less upon its pivots, it must move with greater freedom.

Method of using the Patent Log.

A deep sea-line is to be rove through a small block, affixed to the lee-bow of the vessel, near the surface of the water, and is to be passed aft, as a tow-line for the Log. To the end of this tow-line, the leads which accompany the instrument are to be attached; these are necessary, to bear down the line, and thereby preserve the Log from flying out of the water. To the front of the Log is spliced about ten feet of line, of a size rather less than deep sea-line, which, by means of a spring-hook, is readily attached to the leads, at the end of the tow-line.

Also, by means of another spring-hook, a hauling-up line is readily hooked to the ring, at the hinder part of the instrument. Thus, when the lines are attached, and the instrument is towed in the water, it will have the appearance of fig. 4, pl. 4, where AB represents the ten feet of line, in front of the Log, with

its spring-hook at B,—C represents the leads—CD the tow-line, and E the hauling-up line.

When the instrument is made use of on board a low vessel, the hauling it out of the water may be effected by hand; holding the line rather abaft the tracking of the instrument, and taking care not to strike it against the side of the vessel, when in the act of hauling it up. But, when it is required to be used on board a lofty ship, with channels and ports, a small out-rigger, or davit, the size of an oar, should be provided, having a sheave through its outer end. The inner end of this davit is to be pitched into a cup, fitted to the side of the vessel, rather abaft the tracking of the instrument, and the outer end is to be dropped over the side, to a check-line, sufficiently far to admit of the drawing-up of the Log, clear of the side. The hauling-up line being rove through the sheave, in the outer end of the davit, and the Log being dropped over the side, the whole will have the appearance represented by fig. 5.

The lines being attached to the instrument, and the tow-line being so adjusted, with respect to length, that the instrument may track along in the smoothest water under the lee, place the small engraved hand on the inner

circle of the register, to Zero. Then, bearing out the davit, allow the Log to hang suspended over the side, by the hauling-up line. Now, a person, having hold of the hauling-up line in one hand, and (if no other person be present to note time,) with a watch, noting seconds of time, in the other, is to drop the Log into the water the instant the second's hand is at sixty, where the Log is to remain three minutes, and then is as suddenly to be drawn up,—when the register-hand will be found to point at the rate of sailing.

As the hauling-up of the Log is not so sudden an operation as the letting it drop, it will be necessary to begin drawing one or two seconds previous to the time being elapsed, making a complete run of the line across the deck.

Practice will soon render the use of this instrument familiar, and point out the best manner of adjusting the lines to different circumstances For instance, should the vessel be very short, it may be necessary to take the tow-line to the bowsprit-end, by way of giving it greater scope. Again, should the fast sailing of the vessel subject the Log to fly out of the water, more leads will be required to keep the tow-line down; or, should the Log track too near the vessel, within the adhesive water at the side, it

will then be necessary to bear the tow-line out from the side. This may be effected by sticking a boat-hook into a loop in the line, abreast of the fore-channel, and by fastening the inner end of the boat-hook-staff to an eye-bolt in the bends, two or three feet above the surface of the water, in such manner as to place the outer end of the boat-hook at liberty to lift as the vessel rolled over, and dipped it into the water. Indeed, were a piece of flat board, about six inches square, secured beneath the outer-end of the boat-hook, in such an oblique direction to the surface of the water, as to cause the water, as it passed aft, to trip-up the outer-end each time it touched the surface, it would save the boat-hook from being carried away. However, in this case, attention must be paid, to prevent the boat-hook from sluing, for if it did, the piece of wood nailed to the outer-end might take a direction to hold water, and thereby hasten the very mischief it was intended to prevent. The sluing of the boat-hook may be prevented, by placing its inner-end between two small eye-bolts in the bends, and securing it there by a straight bolt, to be passed through the eye-bolts, and through a corresponding hole in the end of the boat-hook.

Captain Liston of the Transit, on his sixth

voyage to the Mediterranean Sea, as he sailed down the Thames, was instructed by the inventor in the use of this Log; which he applied occasionally, throughout the voyage, with great satisfaction. At the rate of two or three knots, he found that one lead was sufficient to preserve the Log beneath the surface; but, when sailing at the rate of ten knots, it required at least three leads to prevent it from flying out of the water.

As the accuracy of this instrument depends on superior workmanship, it requires the most careful usage. It should be preserved from severe blows; and, previously to its being put away for a length of time, as on coming into Port, for instance, it will be highly necessary to place it in a body of fresh water for a-while, to dissolve the salt about it, and then to dry the instrument thoroughly, which will prevent the register from being set fast by rust. In this latter case, the register-wheels must be separated to clean them, by unscrewing, first, the semicircular piece FF, fig. 2, which covers the teeth of the wheels; and by then taking out the centre screw K, which will allow the wheels to be lifted off their axis very readily.

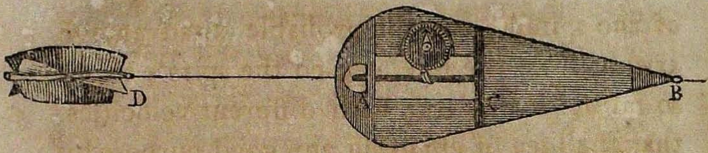
When the necessary experiments, to ascertain the state of perfection of the spirals with

the greatest nicety, were under consideration, the instrument was attached to a float-board, as represented by plate 4, fig. 6, and was immersed in still water,—for the most part, between lock and lock, in the canal by the river Lea—where it was tracked too and fro, through a measured distance, in the centre of the canal, by means of a line leading to each bank. The tracking the instrument as much one way as the other, was done with a view to balance the error that might otherwise be produced by any trifling current or undulation of the water; and it is a practice that should invariably be pursued, whenever the correctness of the instrument is to be put to the test, or whenever it is applied to the purpose of determining a base line. If the instrument is at any time to be put to this test, it must be recollected that the register is calculated to make a complete revolution in half a mile of 3045 feet; therefore, if half this distance be measured along the banks of some still canal, and, if the instrument be tracked to and fro in the centre, the register should make one complete revolution.

Description of the Float-Board.

A B plate 4. fig. 6, is the bottom-board of the float, being thirty inches long, and of a tapering form. Across the front, at B, it is six

inches over, and at the hinder part, at A, it is eighteen inches over. Round the sides and front of this bottom-board is attached a wash-board, three inches deep, as represented by the lighter shading, flaring out from the plane of the bottom-board, at an angle of forty-five degrees. This wash-board is for the purpose of preserving the float steady in the water, as it tracks along; it also prevents it either from oversetting, or diving, when the float is moving with any considerable velocity. Beneath the bottom of the float, in a line along its centre, and at right angles to the plane of the bottom, is secured, edgways, the piece of board C, about three-fourths of an inch thick, the front edge of the board being feathered off, to effect the more ready division of the fluid. This board is for the purpose of carrying the Log at a certain distance beneath the float, so that the spiral may not be sensibly affected by the eddy-water, which is caused by the tracking of the float. Along the bottom edge of the board C, is formed a groove sufficiently deep to receive one of the smaller fins of the Log, which being there inserted, is secured by means of a screw, which passes through the board, and through a corresponding hole in the fin, thereby firmly attaching the Log to the float, as represented in the figure.



Amongst the numerous experiments instituted by the inventor, to produce a perfect Log, he attached one of the four-leaved spirals, by means of a small line, two or three feet long, to the simple register before described, which was framed into a thin flat piece of wood, as AB, in the annexed figure, about one foot long. This, together with the spiral, was immersed in the water, and drawn forward by means of a tow-line fastened to the end B.

The worm which played in the teeth of the register-wheels was fixed on a spindle, that turned in pivot-holes made in the brass bars A and C. The hinder pivot of the spindle being passed through the pivot-hole in the bar A, a nut-eye was screwed on to its end, to receive the line from the spiral D, the spindle being prevented from drawing back, by means of a shoulder on which it turned. The instrument, thus simply contrived, had the advantage of the nicest workmanship; nevertheless, the performance of the spiral was by no means equal to those fitted to turn within the cylinder.—Indeed, the friction occasioned by the shoulder

of the spindle, and the probable disadvantage arising from the line, caused the spirals to act so far from uniform, with different velocities, that the idea of effecting any good purpose by this means, was dropped altogether.

The principle of the Patent-Log is not only applicable to the measuring of horizontal distances, but also to the measurement of distances in any other direction; for it may be advantageously applied to determine the depth of the sea, at those times when the drift or head-way of the vessel will not permit the leads-man to sound with a perpendicular line.

An instrument for this latter purpose may be made to resemble the Log, save the necessity of doing away the lock-notch in front, and applying a gentle ratchet, to prevent the spiral from moving backwards on its return from the bottom.

Such an instrument being fastened to the deep-sea-line, near the lead, with its mouth kept downwards by means of a short piece of line from the centre, at each end of the instrument, will certainly inform us of the perpendicular fall of the lead. The better to adapt the instrument to this purpose, the register-scale may be so altered as to point out fathoms.

For the advancement of philosophical re-

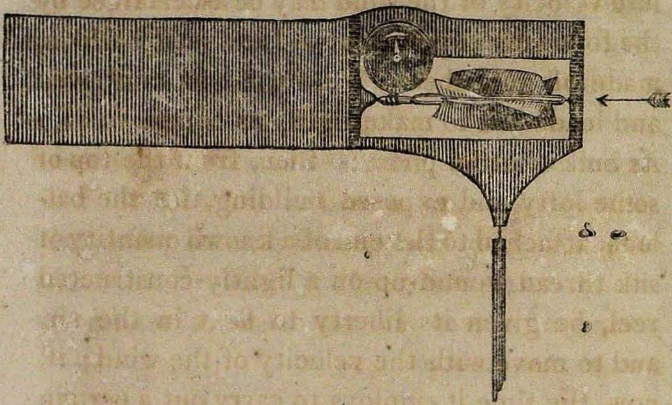
search, by the admeasurement of the extreme depth of the sea, in places where it could not be attained with accuracy by means of the lead and line, this sounding instrument is certainly well adapted. If the instrument is to be thus applied, it will be further necessary to attach a stout brass wire to the centre of the front bar, as represented by AB, in the annexed

figure, through a long slit, in the end of which is fitted the spring-hook B, for the purpose of carrying a leaden weight to sink the apparatus. To the hinder part of the instrument must also be attached, by means of a line, a globe of light wood, or copper-ball, of sufficient capacity to float it. Every thing being thus prepared, set the register to Zero, then, hanging the weight to the spring-hook, put the instrument into the sea, and it will immediately descend, in an erect position, as shewn by the figure. When it arrives at the bottom, the weight striking first, while the instrument continues to descend a little, it will unhook, and the hook will take the position of the dotted line, clear of the lead, leaving the instrument at liberty to ascend freely to the surface.—Experiments of this nature ought to

be made in a smooth sea, otherwise the instrument may be driven by the waves, on its approach to the surface, at a distance from the original spot of immersion, and there will be a risk of losing it. Were the globe of wood provided with an upright, as shewn in the figure, it would serve as a beacon, to point out its position on its arrival at the surface; and, were the globe and beacon painted white, they would form a strong contrast to the inky colour of a deep sea, and assist to render the whole conspicuous.

The *principle* of the Patent-Log may be usefully employed to determine the velocity of the wind. For this purpose, the spiral and register must be constructed of the lightest materials. By way of suggestion, let the axis of the spiral be made of light wood, having small steel pivots to turn upon, with the leaves of the spiral formed of pasteboard, moulded to their proper curve; and to the spiral, as thus constructed, let there be attached a light worm and register of brass, as before described; which, altogether, will have the appearance of fig. 1, plate 4. Now, were the spiral and register framed into a vane, formed of a

thin piece of light board, turning round upon a pole, as representened by the annexed figure,



so that the axis of the spiral might take the direction of the wind, we should then be possessed of an *anemometer*, to acquaint us with the true velocity of the wind. This vane may be used in the following manner:—The instrument being exposed to the wind, from the top of some lofty building, or eminence, an observer, having a watch stopped with its moment-hand at 60, is to give the spiral its liberty. Then attentively observing the motion of the register, he is to unstop his watch at the instant the register-hand is at Zero; and is again to stop his watch, on the return of the register to the same point. Now, the time elapsed will amount to the time the wind has taken to travel half a geographical mile.

For the sake of proving the accuracy of such an anemometer by comparison, the absolute volocity of the wind may be ascertained by the following experiment:--Let a small balloon, made of gold-beater's skin, be so contrived and loaded, as to make nearly an equipoise with its bulk of atmosphere;—then, from the top of some lofty and exposed building, let the balloon, attached to the end of a known quantity of silk thread wound-up on a lightly-constructed reel, be given its liberty to float in the air, and to move with the velocity of the wind; if, now, the time it employs to carry out a certain portion of the thread be noted, there will be certain data to calculate the *velocity of the wind per hour.*—A balloon, being applied after the above manner, may be considered in the light of a *Wind-Log.*

☞ Messrs. Gilbert *and* Sons, *Opticians and Mathematical Instrument-Makers,* N° 148, *Leadenhall-Street, London, are the sole Makers and Venders of the Patent Rate and Perpetual Logs.—Where also may be had Instruments, on the same Principle, to Measure the Depth of the Sea, and the Velocity of the Wind.*

OBSERVATIONS

ON

MARINE-SURVEYING.

OBSERVATIONS,

&c.

On several Methods of determining a Base-Line, that are considered as most applicable to Marine-Surveying.

A Base-Line, in the direction of the meridian is readily determined, by ascertaining the difference of latitude between each end of the base; but, to obviate the error that must arise, if any variation were to take place in the refractive powers of the atmosphere, it is recommended to gain the latitude of each end of the base, by the meridian sun *on the same noon*; because places so nearly contiguous as the extremities of the base, may be fairly supposed to possess the same state of atmosphere at the same time.—It will also contribute to the accuracy of the admeasurement, if the mean difference of several pairs of latitudes

thus ascertained, be taken as the correct result.

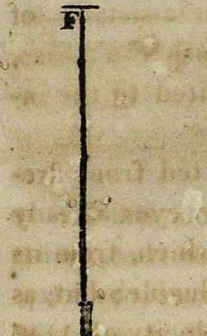
Having determined a base, in the direction of the meridian, we may, by the assistance of trigonometry, apply it as the measure of a base, in any other direction, more suited to the intended survey.

The velocity of sound emitted from fire-arms, affords to the Marine Surveyor a ready mode of measuring distances, which, from its general application, is highly valuable; but, as sound travels with the great velocity of 1142 feet in a second, it will be necessary to take the mean time of several experiments, between flash and report, as the time most approaching the truth.

The Patent-Log, already described in this work, is an instrument that will be found extremely useful to the Marine Surveyor, as being applicable to the mensuration of distances, in every direction on the surface of the water, where tide or currents do not interfere; but, in anchorage-water, the following method is more generally applicable, and is highly deserving of attention, on account of the very accurate measurement which it will produce.

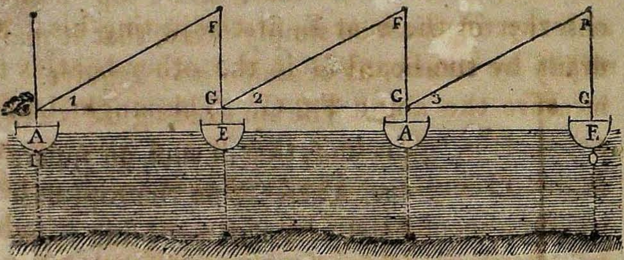
Let two slight and tapering boat's masts be provided, each being of the same length, and

consisting of a lower-mast and a top-mast; with the top-mast so simply fitted, that it may readily be struck, as occasion may require.



The annexed figure is a representation of such an apparatus, where F, on the top-mast-head, is a flat-spreading circular board, or truck, to define the extreme height of the mast; and where G is another flat-spreading circular board, through which the lower-mast passes, serving to define a point at the lower part of the mast, at the exact height of the eye of an observer placed in the boat:—the truck F, and board G, being carefully fitted to stand at right angles to the mast.

Such masts being stepped in boats, adapted to the carrying them along with steadiness, and buoys, or vessels, being placed at H and O, in the following figure, to point out the extremes of the base, the boats, which we shall denote by the letters A and E, are to repair to the buoy H.



A is here to keep her station, and E is to row off in the direction of the base, being careful to preserve her line correct, by keeping in view some distant object in one with the buoy O.—E having passed on to a certain distance, which may be shewn by the points F and G, on the mast of A, subtending a certain angle, (for instance, five degrees, or thereabouts,) she is to let drop a weight sufficiently heavy to anchor herself immediately over it, with an up-and-down cable. The boat E being thus secured, an observer in A, first adjusting his quadrant, by means of the board G, in the other boat,* is to measure the angle F 1 G, which is subtended by the mast of E. This being done, A is to quit her station, and, passing E, in the direction of the base, she, in her turn, is to drop her weight, when the mast of E sub-

* Persons aware of the principles of Hadley's quadrant, must see the necessity of this adjustment.

tends an angle of five degrees; and now an observer in the boat E, first adjusting his qaudrant by the board G in the other boat, is to measure the angle F 2 G. This angle being noted, E is again to proceed, and, passing A, in the direction of the base, is to let drop her weight a second time, when the mast of A subtends an angle of five degrees; which done, the observer in A is to measure the angle F 3 G. Thus, alternately, the boats are to proceed onwards, till the base is completely measured.

Now, in all the triangles, F1G, F2G, F3G, throughout the base, we have given a common side FG, and the angles 1, 2, 3, to find the sides 1 G, 2 G, 3 G, the sum of which is the measure of the base required.

REMARKS.

In light weather, with smooth water, a well-ballasted and full-built boat, from twenty-five to thirty feet long, will be equal to the task of carrying a light tapering mast, as here described, running fifty feet high and more. Admitting, therefore, that fifty feet be the distance between the points F and G, we shall find, on calculation, that when the mast of either boat subtends an angle of five degrees, the boats will be distant 571½ feet, and

that a possible error of a minute in the angle will scarcely produce an error of two feet in the distance; but, if the angle be taken at *less* than five degrees, the error of a minute becomes more and more serious. We have, therefore, thought it proper to state the angle of five degrees, as a prudent limitation; at the same time, however, it is to be observed, that *the greater the angle, the more correct the distance.* Let the angle subtended by either mast be what it may, the same angle should ever be preserved throughout the admeasurement, because the stations are thus kept nearly equidistant, and any possible error of a minute either way, in taking the angle, will thus equally affect any of the distances, and cause so reciprocal an error, that the general result may possibly be more correct, than either of the minor distances taken separately.

An endeavour to simplify, and render more generally useful, a valuable Problem to the Land and Marine Surveyor.

There is no problem more generally adapted to the purposes of surveying, and particularly nautical surveying, than the one which admits of *the determination of any station, by the admeasurement of the two angles made by three objects, whose distance and position, with respect to each other, are precisely known.* It must be, without doubt, exceedingly convenient, and it must materially shorten the process of surveying, if the position of any station can be determined by angles measured at the station itself; instead of its being done by removing to each end of a base-line, to measure the angle which the other end makes with the station in question;—a process requiring several movements, to places which may be very distantly situated, and difficult of approach.

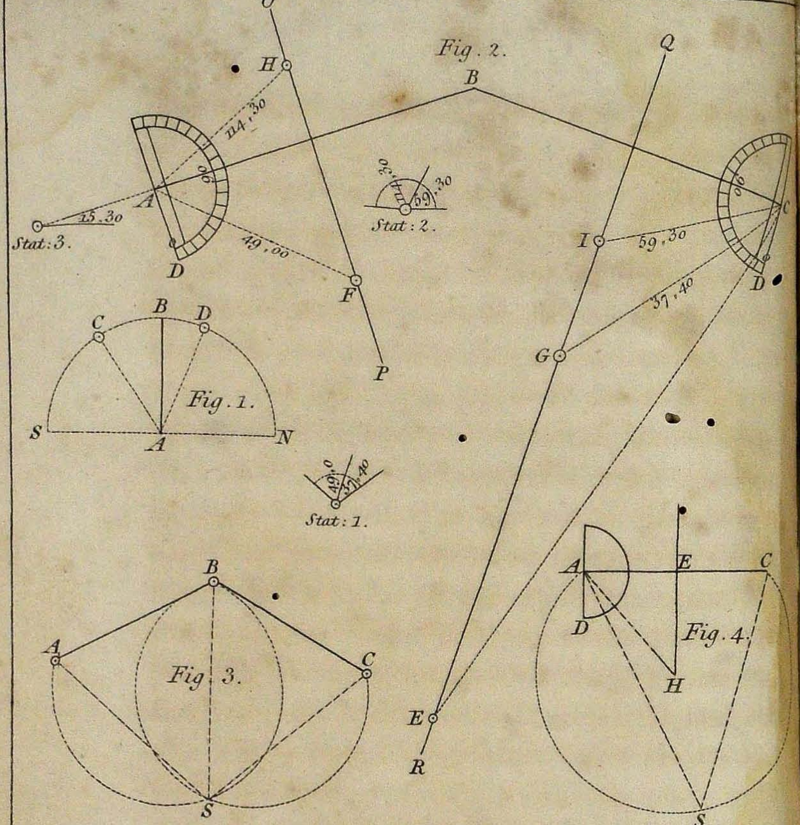
The problem under consideration not only shortens the process of the Survey, but also admits the accurate admeasurement of the angles, with the Reflecting Sextant, on board any vessel, while under sail; which vessel, probably, may be carried at the same time by the

tide, or current, in some unknown direction. Thus, the Maritime-Surveyor, by taking the two angles formed by three known objects, and sounding at the same instant, may continue to lay down an accurate account of the depth of water, whilst the vessel proceeds on her course.*

The usual method of laying down soundings by cross-bearings, is certainly very inadequate to the purpose,—particularly if the bearings cross each other at angles less than forty-five degrees—because the very best azimuth compasses will differ from each other, and even from themselves, when placed in different situations; and, moreover, by employing the compass to take the angles, we are involved in the inconvenience arising from the *variation*.

If the objects whose positions are required for the basis of the Survey form a triangle, by measuring the distance between any two, this distance may be employed as a base, to determine the position of the other object; and the bearings of this base, from the meridian, being known, the objects may be placed on the in-

* To save labour in pursuing this method, without reducing the necessary quantity of soundings, the true position might be determined only *occasionally*, placing the intermediate soundings in a line between the true positions.



J. Lodge sculp.

tended rough Survey, according to their true position.

It is necessary here to observe, that the bearings of the base should be determined with greater accuracy than the compass will admit of; because, any error in the bearings of the base, will affect the whole of the Survey depending upon it.

To determine the bearings of a base-line, with accuracy, let the surveyor place himself, at sun-rise, or sun-set, at that end of the base which is most remote from the sun, and, with a sextant, measure the horizontal arc which the near limb of the sun makes with the object at the other end of the base; to this arc let him add the semidiameter of the sun, and the sum will be the arc, or angle, which the base makes with the sun's centre,—which being added to, or taken from, the sun's azimuthal arc, calculated for the time, will give the bearings of the base from the meridian. For example, let A B, fig. 1, plate 5, represent the direction of the base, and S N the direction of the meridian:—it is required to find the arc S B, or bearings of the base from the meridian. Now, if C represent the setting sun, the observer at the end of the base A is to measure the arc CB, which, being added to the azimuthal arc SC, gives the arc S B required;—but, if the sun

were setting on the other side of B, for instance, at D, then the arc B D must be observed, which being taken from the azimuthal arc S D, will leave the required arc S B.

If a straight coast is required to be surveyed, together with the shoals and soundings, to a considerable distance in the offing, the objects fixed upon as the basis of the Survey should be situated on elevations, having no back-ground, as such objects will be particularly conspicuous; but, if a harbour, or bay, of no considerable extent, is required to be planned, vessels may be anchored as objects for the basis of the Survey, (whose distance from each other may be ascertained by any of the methods explained under the preceding head,) placing them in a line, or more or less triangular, as seems best to meet the shape and purposes of the Survey.

It may be proper to remark, that the angles should be measured with the plane of the sextant held perfectly horizontal; therefore, should the objects be situated on elevations, it will be necessary to measure the horizontal angle of the two objects immediately beneath them.

Were the mode of protracting stations, by means of this problem, rendered more simple, without any confusion of lines and circles, it certainly would become more generally prac-

tised. The author is aware of an instrument invented for the purpose, with arms moving from the centre of a semicircle, which can be placed to the observed angles; but, as the practice of this instrument requires much guessing and shifting about, before the exact station can be hit, he proposes to obviate these defects, by the following process:

The paper intended for the rough Survey being spread, and secured to a deal table by means of leaden weights, let the objects A, B and C, fig. 2, plate 5, which are intended for the basis of the Survey, be placed upon the paper, according to their respective bearings and distances from each other, as previously determined. Now, join the objects A and B, and B and C, by lines, and through the centre of each line draw the perpendicular, or rectangular lines, OP, QR, extending on either side, at pleasure. At the points, A and C, fasten semicircles, fixing their centres at the points A and C, and their diameters at right-angles to the lines A B and B C.*

From the centre of each semicircle must proceed a fine thread, or hair, of a convenient length, for the purpose of setting off the ob-

* *Semicircles* for this purpose are made by Messrs. Gilbert and Sons, Opticians, N° 148, Leadenhall-Street, after a pattern given them by the author.

served angles, on the rough Survey, without a confusion of lines. Being thus prepared, and having taken angles at the several stations, as contained in the following table,—let us, by way of example, proceed to protract those stations on the rough Survey.

TABLE
OF
THE OBSERVED ANGLES.

Stations	$<^s$ between A and B.	$<^s$ between B and C.
1	49°:00′	37°:40′
2	114°:30′	59°:30′
3	....	15°:30′

To protract for Station 1.

From the centre of the semicircle, at A, by means of the fine thread, or hair, set off the angle made by the objects A and B, 49° 00′, as observed from the first station, counting from D, on the semicircle, and mark the point F, where the thread cuts the rectangular line O P. In the same manner, set off the angle made by the objects B and C, 37° 40′, from the centre C, and determine the point G, where the thread cuts the rectangular line Q R. Now, being provided with two pair of compasses, extend one pair to the distance F A, and the other to

the distance G C, and, preserving one leg of each respective pair in the points F and G, swing round the other legs of each till their points meet; and the point of meeting is the station required, marked 1.

To protract for Station 2.

The angles observed from the second Station, between the objects A and B, *viz.* 114° 30′, is to be set off from D, on the semicircle A, as before explained; but, as this angle is obtuse, the thread will cut the rectangular line O P, on the other side of the line A B, in the point H; again, with the other observed angle, *viz.* 59° 30′, determine the point I. Now extending one pair of compasses to the distance H A, and the other to the distance I C, and continuing one point of each respective pair in the points H and I, swing round the others till they meet in the Station required, marked 2.

While the objects continue open, and form two distinct angles, the foregoing examples explain every possible occurrence; but, should two of the objects appear in one, a new case will arise; for instance, suppose the Station required be so situated that the objects A and B appear in the same direction;— so circumstanced, it is clear that the Station must be somewhere in the line B A continued;

and by measuring the angle which the objects B and C subtend from the Station, its position, in the line BA continued, is readily determined. Thus, let us presume the angle between B and C, as observed from the third Station, measured 15° 30′;—with the hair from the centre of the semicircle C, set off the angle 15° 30′, and mark the point E, where the hair cuts the rectangular line, QR; then subtending a pair of compasses to the distance EC, and maintaining one leg in the point E, sweep round the other leg till it cut the line BA continued, which it will do in the required Station, marked 3.

It is necessary here to remark, that whenever the angles observed run under 25 or 20 degrees, particular care must be taken to place the semicircles, and to draw the lines OP, QR, truly rectangular to the lines joining the objects; all the lines too must be drawn beautifully fine, and the angles must be set off with exactness, otherwise the Station found may materially differ from the truth.

To satisfy the inquiring mind, we shall now proceed to explain the truth of the foregoing problem.—Let ABC, fig. 3, plate 5, represent the three known objects, which are given as a basis to determine any station, as S.

Euclid has demonstrated, book iii. prop. 21,

that if from the ends of any cord-line to the segment of a circle, as AB, lines be drawn meeting any where in the circumference, as AS, BS, the angle formed by the meeting of such lines will ever be the same. If, therefore, the angles from the Station required, as ASB, BSC, be given, the Station S is readily attained. For example, on the line AB, considered as a cord to the segment of a circle, create the segment ASB, capable of containing the angle ASB; then it is clear the Station S must be somewhere in the circumference of this segment;—and again, on the line BC, considered as a cord, create the segment BSC, capable of containing the angle BSC, then it is clear also, that the Station S must be in some part of the circumference of this segment. Since, therefore, the Station S is clearly demonstrated to be in the circumference of both segments, it of necessity must be situated in that point where the segments cut each other.

For the sake of constructing the foregoing theory, it is necessary to understand the nature of creating the segment of a circle, capable of containing a given angle at its circumference. For this purpose, let ASC, fig. 4, plate 5, represent the given, or observed, angle, and AC the side, or chord, which subtends the angle:—bisect the line AC, and through the bisec-

tion draw the rectangular line EH, at pleasure. Now, from the point A, set off the line AH, making the angle EAH equal to the complement of the given or observed angle ASC; then the point H, where the line AH cuts the rectangular line EH, is the centre of the circle whose segment is required. Thus it appears, that the process made use of in the foregoing problem, to determine the Stations with the help of the semicircles, is simply to find out the centres of segments in the rectangular lines, OP, QR, fig. 2, plate 5, capable of containing the observed angles.

We shall now shew that the line AH, fig. 4, must of necessity cut the rectangular line EH, in the centre of the segment required, if the angle EAH be made equal to the complement of the observed angle.

Euclid has proved, book iii. prop. 20, that the angle ASC, fig. 4, at the circumference, is equal to the angle AHE at the centre. Now EAH, by construction, is the complement of AHE; and, as AHE is equal to ASC—EAH is the complement also of the given, or observed, angle ASC, which complemental angle is here made use of to determine the centre of the segment.

N. B.—EAH being the complement to the observed angle ASC, if a semicircle be placed

at A, at right angles to the line AC, then DAH on the semicircle, must be the observed angle itself. Therefore, by setting off the line, or hair, AH, from the centre of the semicircle to the observed angle at once, counting on the semicircle from D, saves all the labour of seeking its complement, which, in an extensive Survey, will be considerable.

The reflecting seaman must ever consider it a melancholy circumstance, that the art of Hydrography, which so materially regards the lives of sailors, and the safety of commerce, should still remain so perfectly neglected, in this leading maritime country. At the present day it may be said, that we have attained only a rough outline of the terraqueous globe. This may very well serve the purposes of the closet; but the navigator, who, not mentally, but absolutely visits each part of the earth, requires both detail and correctness of position, in the representation of Coasts and Harbours. How comfortable for him would it be, if, in the time of imminent danger, he was fortunately possessed of the pilotage of some leeward port! How gladly would he then seek shelter from the impending danger! But he is, unhappily, without the means of information:—and correct surveys, and correct tables of latitude and longitude, are not to be expected until Hydro-

graphy and Navigation be encouraged and protected by the State.

To guard the life of the seaman, and to give safety to commerce, is the bounden duty of every nation dependent on navigation for its support. Schools should be established, under the authority of a Board of Scientific Men and Seamen, wherein the science of Hydrography and Navigation should be taught; and were these schools, or colleges, founded on the shores of intricate harbours, it would allow the students the means of acquiring much practical information, whereby the more ingenious would become fit to conduct Hydrographical Surveys, and might be termed Hydrographers; while the generality would be capable of attending to the navigation of ships, under the term of Navigators, and be fit persons to supply the office alluded to in page 107.

The same Scientific Board should attend also to the equipment of vessels, on a plan suited to Marine-Surveying, and to the dispatching them with Hydrographers to explore and survey, first, the more frequented, and afterwards the uttermost, parts of the globe;—and the Surveys thus obtained should be published under the authority of such Board. A proceeding to this effect would, in time, do away the nefarious practice of manufacturing sea-charts

by means of plagiarism, hear-say and fancy. These, certainly, by their external neatness recommend them to a purchaser: — but, lo! in the sequel, they betray their owner,—they bewilder, and lead him to shipwreck and destruction!

ON THE

PRINCIPLES AND DESCRIPTION

OF AN

OPTICAL INSTRUMENT,

APPLICABLE TO

The Mensuration of Distances:

INVENTED BY

R. H. GOWER.

ON THE

PRINCIPLES AND DESCRIPTION

OF AN

OPTICAL INSTRUMENT,

&c.

Let AB and CD, fig. 5, plate 5, represent two speculums, facing each other,—set perpendicular to the same plane, and at a certain distance,—at the same time, making an angle of 45 degrees with their line of separation, L M. Being thus placed, if a ray of light, from the very distant object F, fall upon the speculum A B, perpendicular to the line of separation LM, it will be reflected from A B to C D, and from C D, along the line of sight, to the eye at E; and, if the line of sight be exactly over the top-edge of the speculum C D, the eye will view the reflected object *f* in one with the real object F:—but, if a ray from the nearer object H, (whose distance bears a sensible proportion to the separation of the speculum

LM,) fall upon the speculum AB, it will be reflected on one side of the line LM, and will not fall on the speculum CD, so as to produce a contact between the real and reflected objects. Now, in this case, if a certain angular motion be given to the speculum AB, equal, in this instance, to the angle BLK, then also the reflected object and the real object will appear in one; and, on examination, it will be found, that the angular motion of the speculum BLK, which has produced this effect, is ever half the angle LHM; therefore, if an index be affixed, to move round the speculum AB, we shall at once become acquainted with the angle BLK, and, consequently, its double LHM. —The angle LHM being ascertained by observation, the distance of H is readily determined by trigonometry; for, in the right-angled triangle LMH, we have given the angle LHM, and the constant separation of the speculums LM, to find the distance of the object HM; and, if the side HM, be considered as radius, we the have following proportion:—

As the tangent of LHM,
is to the constant side LM, or unity,
so is radius
to the distance HM.

Now, as the constant logarithms of unity ever occur, we have merely to subtract the

tangent of the angle given by the index from radius, and the remainder will be the logarithm of the distance in feet, if LM be a foot; or in yards, if it be a yard; and so on, according to the measure of LM.

Fig. 6, plate 5, is a representation of an instrument for the mensuration of distances, constructed on the foregoing principle. ABE is a frame of wood, in some measure resembling the frame of a quadrant, but having three feet radius, and an arc of ten degrees only. This frame is strongly supported by cross-bars, at the back of which is secured a piece of wood, set edgeways, to prevent the plane of the frame from warping in the direction of its length. AFG is a thin facing of brass, of eighteen inches radius, which being previously divided, so as to read off to each ten seconds of a degree, is then firmly screwed to the wooden frame. AC is the line of the index, the nonius being moved along the arc FG, by a tangent screw at C, which is placed at the lower arc, for the convenience of meeting the hand of the observer. A is the index-speculum, and B is the eye-speculum, the centres of the quick-silvered sides of which, are exactly three feet apart.

The index-speculum, which is three inches long, and one and a half high, is fixed to the

index AC, after the manner of the best sextants, so that it may stand at 45 degrees, with the line which separates the speculums, when the index is at Zero. It is provided with the means of placing it perpendicular to the plane of the instrument, and parallel to the eye-speculum. The eye-speculum is provided also with perpendicular and parallel adjustments, similar to the horizon-glass of a sextant. It is half the height of the index-speculum,—is about three-fourths of an inch wide,—and is wholly done over with quicksilver at the back, the top edge of which is preserved extremely even. BE is the line of sight, proceeding from the centre of the quicksilver, at the top-edge of the eye-speculum, in a direction parallel to the plane of the instrument, and perpendicular to the line which separates the speculums. The perpendicular direction of this line is strongly marked on the plane of the instrument, for the convenience of placing the axis of the telescope in the same direction. BI is a pole to bear up the instrument from the ground, so that the eye of the observer may exactly meet the eye-glass of the telescope. This pole is so fitted to the frame of the instrument, that it may be taken away at pleasure. H is a handle on the pole, whereby the instrument is kept steady.

Adjustments.

First, set the axis of the telescope in one with the line of sight. This is done by causing the outside of the cylindrical tube of the telescope to be parallel to the plane of the instrument, and parallel also to the direction of the line which is strongly marked on the plane of the instrument. Secondly, set the index-speculum perpendicular to the plane of the instrument: this is done similar to the same adjustment in the quadrant. Thirdly, set the eye-speculum at 45 degrees, with the line which separates the speculums. To effect this, stick a small spot of white paper at the centre of the index-speculum, and move round the eye-speculum, until the small spot is reflected by it through the axis of the telescope to the eye of the observer. Fourthly, the index being at Zero, set the index-speculum parallel to the eye-speculum; which is simply effected by the following means:—by calculation it appears, that at the distance of forty yards, (one yard being the distance of the speculums,) the angle L H M, fig. 5, will be equal to 1° 25′ 55″; consequently, if we place a strong horizontal line on a level with the observer's eye, at the distance of forty yards, and fix the index of the instrument to the angle 1° 25′ 55″,—on

viewing this line, with the instrument held perfectly erect, its direct and reflected image should appear in one, if the speculums be parallel; but should it be otherwise, the index-speculum must be moved round, to cause the images to appear in one, when the speculums will be truly parallel with the index at Zero.

The instrument being thus prepared for viewing any distant horizontal line, whose direct and reflected images are caused to be in one, we may then apply this line as the means of setting the eye-speculum perpendicular to the plane of the instrument, which is thus effected :—the instrument being held erect, and the direct and reflected parts of the line appearing in one, the instrument is then to be inclined to the horizon; and, if they still continue in one, the speculum is perpendicular to the plane, but, if otherwise, the speculum must be so moved, by the perpendicular adjustment-screw, at the back of the instrument, as to cause the images to appear in one, when the instrument is completely adjusted in every respect.

The error of the index may be simply ascertained, at an instant, by placing the strong horizontal line at forty yards off, and then having moved the index, until the direct and reflected images of this line are in one, read

off the angle,—and whatever it differs from 1° 25′ 55″ is the error of the index. Such are the adjustments of this instrument, which any person, accustomed to the use, and acquainted with the principles, of Hadley's quadrant, will readily perform.

In applying the instrument to the determination of any distance, as, for instance, the top of a wall, house, or chimney, all of which are clear and well defined objects, when the sky is their back-ground, let the observer place himself to the instrument, grasping the handle H with his left hand, and directing the telescope to the object, while his right hand remains at liberty to move the index, till the reflected object is in one with the real object; then the tangent of the index-angle being taken from radius, will leave the logarithm of the distance.

To dwell upon the general application of an instrument of this kind is perfectly needless:—the scientific man must at once see the many advantages that must arise from *possessing the base in our own hands*, whereby distances may be measured in every direction, whether horizontal, or vertical. The author trusts these practical suggestions may be so put in force by some exquisite workman, as to render an instrument of the kind highly valuable.

Without doubt, the base here made use of, *viz.* the distance between the speculums, is extremely small, compared with the distance to be measured, and places our dependance on the determination of an extremely small angle, which, from the flexibility, the warping, the expansion and contraction of such materials as are applicable to the framing of the instrument, must naturally throw impediments in the way of perfection; but the following account of the performance of the instrument just described, (which has never been a second time in the hands of the maker, to receive improvement,) is sufficient to encourage a hope that more is yet to be effected.

The inventor having given himself some practice in the use of the instrument, invited Mr. John Adams, teacher of mathematics, at Edmonton, to witness its application. — A straight piece of level ground was chosen for the purpose, and the distance of 1443,8 feet was measured twice over by the chain, with all possible care. A staff was then provided, across which, at the height of the observer's eye, was fastened a piece of board, about two feet long and four inches wide, and the face of the board was covered with white paper, with a strong black line drawn along its centre, a quarter of an inch thick:—the line

being the object fixed on to determine the distance of the several stations, which were rendered shorter than the accuracy of the instrument required, for want of sufficient light on the object, or a clear sky for a back-ground. The staff was carried by Mr. Adams, and held up at a certain distance, while the inventor took the angle; which being read off, and noted down, Mr. Adams was directed to leave an arrow in the position of the staff. Both parties now proceeded onwards, until the inventor arrived at the arrow, when Mr. Adams holding up the staff again, a second angle was observed, and noted; and so on they proceeded, throughout the distance, to take the several angles which are contained in the left-hand column in the following *Table.* These angles were given to Mr. Adams, who ascertained the results contained in the right-hand column: and the sum total will be found to differ so immaterially from the actual measurement, by the chain, as to render it impossible to say which is the most correct result.

TABLE.

Angles. °	′	″	Radius less Tangent	Yards.
1	41	30	1, 52968	=33, 86
1	9	0	1, 69737	=49, 82
1	46	55	1, 50709	=32, 14
1	12	20	1, 67687	=47, 52
1	34	25	1, 56112	=36, 40
1	11	10	1, 68394	=48, 30
1	44	30	1, 51702	=32, 89
1	9	0	1, 69737	=49, 82
1	24	50	1, 60762	=40, 52
1	21	10	1, 62682	=42, 35
1	50	0	1, 49473	=31, 24
1	34	10	1, 56227	=36, 50
Yards				481, 36
				× 3
Admeasurement by instrument in feet....				1444, 08
D° by the chain..........				1443, 83
Difference three inches, or				...., 25

Remarks.

The instrument here described may certainly be materially improved:—for instance, if the speculums were formed of metal instead of glass, they would cause a stronger reflected

image, and, were the frame composed of wooden cylindrical tubes, three or four inches in diameter, well secured with brass hoops, it would cause even a large instrument to be light, and would be less subject to spring or alter, when exposed to different temperatures. Another improvement would be, to reverse the instrument, and to use it with the index-speculum down, as this position would render it more manageable, were the instrument even five feet long, or more; but, should it be made longer than the height of the observers' eye from the ground, the observer must be mounted upon a stool. The reversing the instrument will also take away the necessity for so long an index, because the hand can then conveniently meet a tangent-screw attached to the index, at the arc F G.

Were the speculums ten feet apart, and were the instrument capable of measuring an angle within the limits of five seconds, it would determine the distance of 1000 feet within the limits of two feet, at one observation.

Before this subject be concluded, it is the inventor's wish to notice more particularly, the division adopted to ascertain each ten seconds of a degree, and to state that, independent of

its application to this instrument, it is neatly adapted to a division for astronomical and surveying instruments in general.

On the Division of the Arc.

Each degree of the arc is divided into six parts, of course each part is equal to ten minutes, or 600 seconds.—The nonius is made to spread 61 of these parts, or 36600 seconds, and is itself divided into 60 parts; if, therefore, we divide 36600 by 60, the quotient, 610, will be the number of seconds contained in each part of the nonius, which, as they exceed each part of the arc, by the amount of ten seconds, must evidently produce the required division.

The better to enable the observer to read off with readiness, each degree of the arc is denoted by a certain length of stroke, each 30 minutes by a stroke somewhat shorter, and each ten minutes by a stroke still shorter than the last. On the nonius also, each sixth division, which represents minutes, is denoted by a certain length of stroke, numbered from one to ten; each third division, which represents thirty seconds, by a stroke somewhat shorter; and the minor division, which represents ten seconds each, by a stroke still

shorter than the last. This division was executed by the correct hand of the indefatigable Mr. Stancliff, on an arc of eighteen inches radius; this being nearly to the extent of radius that his dividing-machine would conveniently perform.

MODE OF APPLYING

THE

HEIGHT OF A VESSEL'S MAST

AS

A BASE LINE,

TO

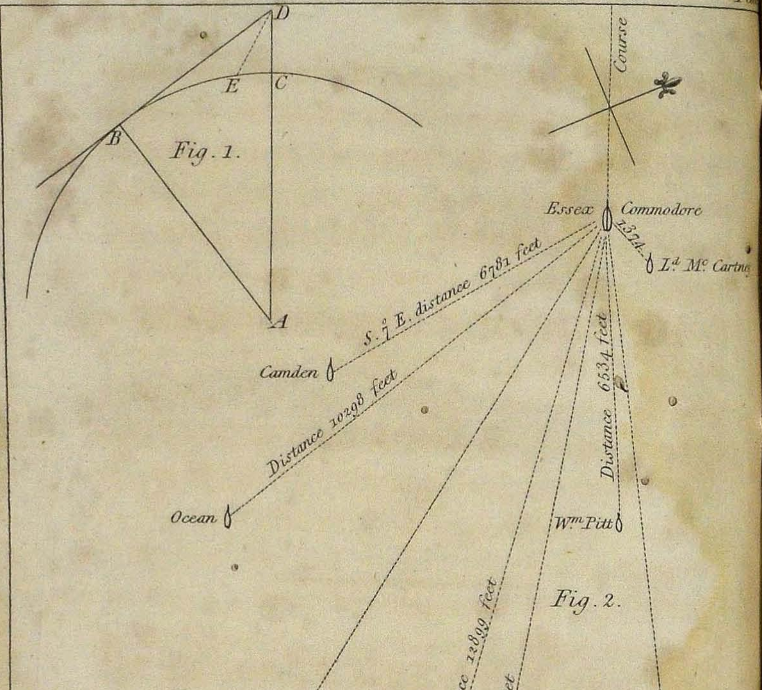
DETERMINE THE DISTANCES OF OBJECTS

SITUATED WITHIN THE

CIRCLE OF THE SENSIBLE HORIZON;

AS VIEWED

From the Mast-Head.



Scale, a ¾ Inch to 1000 feet.

J. Lodge

MODE OF APPLYING

THE

HEIGHT OF A VESSEL'S MAST

AS

A Base-Line,

&c.

To explain this desirable problem, let BC, fig. 1, plate 6, represent that portion of the great circle of the earth which passes through the vessel C, and the object E, whose distance is to be determined. Let A be the centre of the earth, AC its semidiameter, and CD the height of the observer's eye above the surface of the earth.

The observer being situated at the mast-head, with his eye at the point D, can distinctly view the sensible horizon at B, in the direction of the tangent to the great circle BC. He can also distinctly view the object E, within the circle of the horizon, and by

means of his reflecting sextant, he can measure the angle B D E, formed by the horizon and the water-line, about the rock, or vessel E. Now, if from the centre of the great circle be drawn the semidiameter A B, meeting the tangent B D at right angles, we shall have the rect-angled triangle A B D, in which is given A B, the semidiameter of the earth, and A D, the semidiameter increased by the height of the observer, to find the angle BDA. From B D A subtract the observed angle BDE, and we shall have left the angle E D C, which is formed by the object and the observer's nadir. Having thus obtained the angle E D C, we are now to apply the triangle E C D, to find the distance of the object E; and as the small arc of the earth, C E, may be considered as a plane, the triangle may also be considered as rectangular, at C. Such being the case, in the triangle E C D, we have given C D, the height of the observer's eye, and the angle E D C, to find the distance of the object E C.

Example.

Fig. 2, plate 6, is a draught of the absolute position of a fleet of East-Indiamen, as determined by the author, from the *Essex*, on the 30th of October, 1796, in latitude 6° 58′ N. and longitude 92° 25′ E.

To effect the necessary observations, whereby to complete the draught, an observer on the deck took, first, the bearings of the *Camden*, S. 7° E. and then proceeded with the sextant, to take the horizontal angles in succession, between the *Camden* and each vessel of the fleet, (as contained in Table I.) while at the same time, the author, being situated in the cross-trees, with his eye 104 feet above the surface of the sea, measured the vertical angles between the sensible horizon and each of the vessels, (as contained in Table II.)

TABLE I.

Ships.		Ships.	°	′
Camden.....	to.......	Ocean	8	5
D°........	—......	Manship........	28	15
—........	—......	Goddard........	43	53
—........	—......	Asia...........	49	30
—........	—......	Wm Pitt........	62	8
—........	—......	Alfred	66	49
—........	—......	Lord McCartney .	101	35

Now, the bearing-line of the *Camden* having been placed upon the paper, the remaining bearing-lines were readily layed down, from the horizontal angles contained in Table I. and are represented by the dotted lines in the draught. The draught being so far established,

we had now to calculate the distance of each vessel from the *Essex*, which distances being set off on their respective lines of bearings, rendered the draught complete in every respect. — It should be noticed, that to obtain this object, we must first produce the angle BDA, fig. 1, plate 6, by the following canon:

In the right angled triangle D B A.

As AD=8089584$\frac{2}{3}$ yards	. . .	6, 9079261
is to radius	. . . .	10,
so is AB=8089550 yards	. . .	6, 9079244
to the sine of BDA=89° 50′ 17″=		9, 9999983

The angle thus sought, 89° 50′ 17″, being taken from each of the observed vertical angles contained in Table II. will leave the various angles, as E D C, which are formed by each vessel and the observer's nadir, — and which are contained in Table III.

TABLE II. TABLE III.

Ships	° ′		° ′ ″
Camden	0 43	....	89 7 17
Ocean.........	0 25	....	89 25 17
Manship.......	0 6	....	89 44 17
Goddard.......	0 18	....	89 32 17
Asia..........	0 14	....	89 36 17
Wm Pitt.......	0 45	....	89 5 17
Alfred........	0 10	....	89 40 17
Lord McCarteney	4 10	....	85 40 17

Having thus obtained the angles contained in Table III. we are enabled to calculate the distances of the vessels, by the following short canon:

In the rectangled triangle DCE, fig. 1, plate 6.

As radius............
is to CD, 104 feet 2, 0170333
so is the tangent of 89° 7′ 17″ 1, 8142919

to CE, the distance of the *Camden*, 6781 ... } = 3, 8313252

Now, as the logarithm of 104 is constant, the distances of the remaining vessels are

readily calculated, and are expressed on each line of bearing represented in the draught.

The following *Table*, containing the angle BDA, fig. 1, plate 6, for such heights as are most likely to be required, is introduced, to save the labour of calculation, and to render the problem more generally useful to seamen.

TABLE IV.

Feet.	°	′	″
81	89	51	15
84	89	51	8
87	89	51	1
90	89	50	54
93	89	50	47
96	89	50	40
99	89	50	32
102	89	50	25
105	89	50	17
108	89	50	8
111	89	50	0
114	89	49	51
117	89	49	40
120	89	49	28
123	89	49	16
126	89	49	4
129	89	48	51

Remark.

To apply this problem with readiness, the observer should be provided with the exact height of that part of the mast from which he means to take the angle, formed by the horizon and the object whose distance is required. This measurement may easily be obtained, by taking up to the mast-head the end of a hand-lead-line, and then, (having suspended the lead over the side of the ship,) allowing its bottom to touch the surface of the water; the different heights on the line are to be marked; as the top, the cross-trees, the top-gallant-yard, &c. This done, let the line be taken down and measured, being careful at the time, to preserve it stretched with the same degree of tension as when aloft; which may be effected upon deck, by passing the line through an easy stationary block, then stretching it along, allow the lead, and about one-third more weight to hang suspended by the line, and this will be found equal to produce the same degree of tension, as the one-third more will about make up for the loss occasioned by the friction of the block.

These heights being once ascertained, they should be noted down, with the ship's draught of water at the time; so that, should any altera-

tion take place in the draught of water, the same may be so allowed as to produce the required height at any instant of time.

By way of illustrating the use of Table IV. the following example is given:

Example.

Required the distance of a rock, or vessel, which, when viewed from the cross-trees, with the eye 104 feet above the surface of the sea, was observed, by means of a sextant, to be 0° 43′ within the limits of the sensible horizon.

From Table IV. seek out the angle placed against the number of feet nearest to the height of the observer's eye, *viz* 89° 50′ 17″; and from this angle, subtract the observed angle 0° 43′, and we shall have left the angle 89° 7′ 17″. Then say,

As radius	10,
is to 104	2, 0170333
so is the tangent of 89° 7′ 17″	1, 8142919
to the required distance 6781 =	3, 8313252

DESCRIPTION

OF AN

EYE-SHADE,

FOR THE USE OF

WEAK-SIGHTED PEOPLE,

WHO

Suffer, as they Walk,

FROM THE

STRONG LIGHT AND HEAT WHICH IS REFLECTED FROM A LIGHT-COLOURED SOIL.

INVENTED BY

R. H. GOWER.

DESCRIPTION

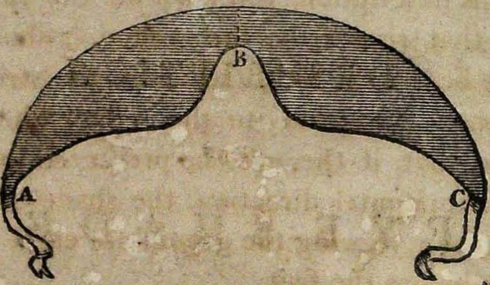
OF AN

EYE-SHADE,

&c.

THE author of the foregoing Tracts having suffered much in his eye-sight, from reflected heat in warm climates, was under the necessity of inventing a sort of screen, or shade, to place beneath his eyes, which has effectually defended them; and has by no means a disagreeable appearance. This shade being used when the eyes are suffering pain from the sun's rays, reflected strongly from a light-coloured soil, produces the same pleasing effect as when the eyes are cast over a green field, which renders it an instrument well worthy the attention of persons who have a weak sight, and who suffer from reflected heat.

*Description.**



ABC is a thin piece of light wood, with the inside curve, ABC, shaped to the formation of the face beneath the eyes, and about twice the size of the engraving. This board is neatly covered with green silk, and has pieces of ribbon affixed to it, proceeding from the points A and C, which tie behind the head, and confine the shade to the face, beneath the eyes, where it is supported by the nose in a horizontal position. For the convenience of carrying the shade within a pocket-case, it is formed of two pieces, A and C, which are united by a hinge and catch at B. Thus, the catch being loosened, the parts of the eye-shade may be folded together, into half the original length.

* One of these Shades may be seen at Messrs. Gilberts', opticians, N° 148, Leadenhall-Street, where any person may have such an instrument adapted, as it ought to be, to his own conformation of features.

It must be readily conceived that a shade of this description, will keep off the reflected heat that rises from the ground, a short distance before the feet, (which is the strongest and most pernicious to the sight,) when it is stated that, if the eyes be preserved in their usual horizontal direction, the shade will prevent their viewing the ground for eight or ten *yards* before the feet.

A round hat will be generally sufficient to defend the sight from the *direct rays* of the sun, while the *eye-shade* beneath, will protect it from the *reflected rays*.

Many persons may object to the usage of such shades, from the novelty thereby produced, as formerly, no doubt, many were prevented the salutary use of spectacles, when they walked the streets. But custom has precluded the necessity of these finer feelings, and has rendered the sight of these objects so familiar to all, that people no longer mark a person, because, unfortunately, he is put to the necessity of using them.

The inventor feels convinced, that the introduction of these shades, particularly in warm climates, would be highly beneficial;—the vision of the strong-sighted would thereby be prolonged, and the vision of the weak-

sighted would not only be prolonged, but comforted.

To the foregoing description, the author adds the following account of a mode, whereby the feeble vision of an elderly person was strengthened beyond expectation. The communication was made by a literary friend, who took the general outline from the *Bibliotheque Medico-Physique du Nord,* (vol. ii. page 204.) A gentleman of sixty years of age, whose feebleness of sight was excessive, contrived a mode whereby this defect was in a great measure removed. He took a moderate length of the tube of a pocket telescope, and, having removed the eye-glass, he affixed at the end of the tube a piece of black Morocco leather, in the form of a hollow cone, with a small aperture at the apex. By applying his eye to the larger orifice of this prepared tube, he was enabled to read, distinctly and without pain, the smallest print. He provided two of these tubes, and varied their length and the diameters of their smaller apertures, whereby he found that the smaller the opening the more distinctly he could read, but that for the sake of reading with freedom, and without turning the head, it was necessary to have them wider, which admitted of seeing more words and lines at the

same time. The usage of each sort of tubes was, therefore, changed alternately, and by this practice he gained relief. The materials of which the instruments are to be constructed is recommended to be light, and the insides of the tubes to be covered with black, and to be made to elongate at pleasure, with the power of varying the diameter at the apex.

An interesting note is appended to this account, by the editor of the *Bibliotheque*, which consists in an extract from a treatise by the learned *Boerhaave*, entitled, *De Morbis Oculorum*, published at *Gottingen*, 1746, under the care of *Haller*:—the substance of which is as follows:

An English gentleman of considerable talents had the mortification to find his vision begin to fail him, so that he could not read, either with his eye close to the page, or at a distance from it. He had tried a variety of remedies to no effect; and his sight grew alarmingly more feeble every day. He had, however, often observed, that those persons who had weak eyes were in the habit of closing them nearly, so as to let in very little light upon the pupil; and that they frequently encircled the eye with the hand drawn up into the form of a tunnel. Reflecting seriously on

the theory of this natural process, he determined on trying the effect of a mode more artificial. He accordingly procured two conical tubes of leather, blackened on the inside, and having a small orifice at their apices,—the bases of which he applied to his eyes, and the points he turned to an object. By this contrivance, the lateral rays were cut off, and the main body of light was admitted only in front; and this simple remedy proved so effectual, as to re-establish his eye-sight completely.—The editor of *the foreign Journal* goes on to say, that the usage of similar tubes, for the space of three or four months only, will be found so advantageous to vision as to restore the sight, if it were ever so feeble before.

To convince the credulous reader, who may seem to doubt the truth of the foregoing anecdotes, the author requests to draw his attention to the following remarks. Luminous objects are rendered distinct by the light which is emitted or reflected from themselves; and the external shapes of dark objects, or such as do not emit, or reflect light, are rendered visible by being contrasted with a white field, or back-ground;—thus, black letters are made distinct from being printed on white paper. Such being the case, to effect a more

distinct view of a luminous object, it is necessary, as much as possible, to get rid of all light that is not immediately emitted, or reflected, from itself; and this circumstance, no doubt, may, in a great degree, be effected by the use of tubes to look through. To give a grand and striking example of the benefit to be derived from the use of tubes, let any one get to the bottom of a deep and empty well, and he will find that his sight is thereby rendered so keen, as to view the stars, even at noon day. Now, what is the well, more than a very long tube, sufficiently large for both eyes at once to view the heavens, which, precluding the light of day, renders the effulgence of the stars conspicuous?

The familiar notice of the above discovery will induce, it is to be hoped, some ingenious optician to attempt the formation of *Reading Tubes*, for the use of weak-sighted persons, who derive no benefit from glasses. To such ingenious optician, the following hints may be of service: It is necessary that the conical tubes employed, should be light and portable;—that the larger ends of the tubes be made to conform to the shape of the face surrounding the eye, so as completely to exclude all light from entering at their bases;—and that

the apertures be brought close together, at a distance from their base, which shall be short of the meeting of the axes of the eye, so that the axes of the eyes and tubes may meet in the same line, otherwise the two apertures, with a double object, will be seen. Probably a single conical tube, so flattened at its base, as to comprehend both eyes, might be found more convenient than two. From a rough experiment which the author made, he believes the tubes should not exceed the length of three or four inches. He is of opinion also, that such tubes may be neatly and portably formed of black Morocco leather, set out with several equi-distant rings inside,—the rings being sewed to the tubes, in a line, at one part only, which sewing will form hinges for the rings to be moved upon. Now, a wire being secured along the rings, in a line opposite to the hinges, by pulling upon the wire at the larger end of the tube, the rings may be drawn flat inside of the tube, which will admit the tubes to be folded flat, for the convenience of placing them away in a portable case. The tubes to be confined to the eyes by a ribbon, in the manner of gogglers.

APPENDIX.

APPENDIX.

Note A. *Page* 4.

The extreme degree of expansion and contraction to which a hempen rope is subject, renders it very unfit for the *standing-rigging* of a ship; so much so, that if the rigging of a vessel were to be set up on a fine dry day, to a proper degree of tension, for the necessary support of the masts, the first wet day would so contract the rigging, as to increase the tension to such an extraordinary degree, as would not only render it liable to tear the sides from the bottom of the vessel, but also to cripple the masts by the pressure produced, and to occasion the snapping of the rigging.—Then, on the next dry weather, the rigging would become so extremely slack, as to be incapable of supporting the masts with safety. These evils are only to be avoided by securing the masts, by means incapable of expansion and contraction; for the attainment of which most desirable object, the author begs leave to suggest the following remark:

A rod of wood, as *fir*, for instance, in the direction of its fibres, is capable of bearing a far greater weight than a piece of rope of equal diameter, without suffering the least alteration in its length, of which, indeed, it is incapable. Now, if the *standing-rigging* of a vessel were formed of *wooden rope*, (if it may be so expressed) or chain, composed of cylindrical pieces of wood, united by iron straps at each end, passing through each other, we should not only become possessed of strong and non-elastic rigging, but also of rigging possessing the further

good properties of being more light, more durable, less expensive—and, what is of still greater importance to the nation at large,—a rope which places us less dependent on the Baltic trade: because a ship thus rigged, would certainly not require more than half the quantity of hemp and tar which must otherwise be made use of on the same occasion; and the rigging being once set up, with a small degree of force, will require no further setting-up.

NOTE B. *Page* 51.

THE Coxswain of the Hydra's boat, on this occasion, was the seaman that pulled the stroke-oar of the King's barge, on the embarkation of the Royal Family, mentioned in page 28; and of course he could not but be privy to the conversation and remarks of the Royal Party. This person, in conversation with Mr. Liston, first officer of the Transit, related, that the whole party were highly gratified by the prompt manœuvring of the Transit; and that his Majesty's curiosity was so highly excited, as to induce him to ask many questions concerning the vessel: but without receiving any satisfactory answers.—Indeed, satisfactory answers could only have been obtained by application to the inventor, who was then so very near at hand. Had the naval gentlemen accompanying his Majesty been the least inclined to favour attempts at naval improvement, the present circumstance would have afforded the most favourable opportunity; by introducing the inventor, and thereby gaining the sanction, and the high patronage of his Majesty.

NOTE C. *Page* 55.

WHEN on the point of quitting Lisbon, (Nov. 13, 1801,) and in the act of mustering my passengers, I was informed by Mr.

Dorman, my agent, that five persons had thought proper to quit the Transit, and had actually sailed in the Duke of York Packet; leaving me to pocket half their passage-money.—On requesting Mr. Dorman to account for this extraordinary conduct, it came out that reports had been spread so very disadvantageous to the Transit, that they rather chose to give up half their passage-money, than risk their lives on board her.—It had been said, that she had been fortunate in making her passage out, in *fine weather*, and *smooth water*; but that she would certainly prove a coffin to all who should venture themselves on board her, homeward bound, at this perilous season of the year.—The passing the Duke of York, therefore, was a matter of high exultation to all on board the Transit, who gloried to see her bobbing up-and-down to the sea, and standing on the opposite tack, while they themselves were making good their course for old England. In turn, the Transit was seen by the passengers on board the Duke of York, who, almost breathless with sea-sickness, heartily regretted their credulity. This circumstance I was given to understand by Mr. Radimaker, who freighted the vessel out on account of the Portuguese Government, and who was the particular friend of these passengers. He moreover told me, that, what with staying at Falmouth to recover themselves from sea-sickness, and what with the expense of their journey, by land, to London, it cost them three times as much as my passengers had paid me for bringing them from Lisbon, up the Thames, to Blackwall.

Note D. *Page* 64.

In the construction of the Transit's rigging, all things were calculated and contrived to meet their exact position; so that it became difficult to suggest any partial alteration, without such a general interference with the remaining mechanism, as would impede the working and sailing of the vessel. An in-

stance to this effect took place on the commencement of her third voyage to the Mediterranean Sea. It was supposed, by those who now own the Transit, that the vessel's sailing would be improved, by giving the fore and-aft sails more canvass in the after-leaches :—the sails were accordingly made larger, and new gaffs and booms were prepared, to spread these increased sails. But, what was the consequence? When all was ready, and the vessel on the point of sailing, it was then, for the first time, discovered, that the sails were too large to swing between the masts, and that they must again be reduced, before the vessel could be sent to sea. This dear-bought experience, which might have been prevented by consulting the inventor, it was reasonable to suppose would have caused deeper reflection previously to any further alteration of the *original Transit.* Regardless, however, of experience, the head-sails, which were already as much as the fore-mast could well cope with, have lately been increased to a preposterous size, without being likely to produce any advantage to the sailing of the vessel, except in light weather, and with the wind large. Thus, for the sake of an occasional and slight advantage, the vessel may be deprived of the use of her fore-mast, and thereby suffer all the danger and delay, which is usually attendant on such a catastrophe. This alteration was made in August, 1807.

To instance a further alteration—these enlarged sail's are made with *long clews,* after the old custom, a practice which the inventor discarded, when he formed the Transit's original head-sails, and adopted *cringles* in lieu of them. These *cringles* were set in so close to the clew-corners of the canvass, that, when the sail was sheeted-home, the very clew-corners set quite into the sheave-holes at the yard-arms; whereas, a long clew, although close sheeted-home, will cause the canvass to fly off a certain distance from the sheave holes and the yard, which is certainly much against the flat-setting of the sail, and has a very slovenly appearance.

The mode, too, of clewing-up the Transit's fore-top-sail, has been changed for *old custom*, without any reason being adduced, further than the natural propensity which men have of falling into their old habits. The Transit's fore-top-sail was originally taken-in by bunt-lines, which led through blocks suspended beneath the cross-trees, and through blocks strapped to the tie-block upon the yard, in the usual way; but from these blocks they led in a new way, through two well-turned thimbles, strapped into the bolt rope, at the points were the bunt-lines bend, and thence were led to the clews of the top-sail, where their ends were fastened. By this plan, the bunt-line and clew-line were included in one rope; which, from the increased force thus put upon it, required to be stouter, and demanded the additional force of a whip, or gun-tackle purchase, which was attached to the leg, or pendant of the bunt-line, abaft the mast. By this mode of clewing-up a top-sail, the sail was instantly disarmed of the wind, without even regarding the braces; for, directly the sheets were started, the sail flew out forward, without bagging the wind, and consequently was readily drawn up before the yard, by the bunt-lines thus rove; whereas the clew-lines abaft the sail, in the old-fashioned way, do but tend to bag the winds which prevent the sail from spilling.

There is another alteration also made in the Transit, which, as it is of moment, the inventor is obliged to mention. The Transit's hull was originally completed with a flush deck, which was surrounded by a stout bulwark, about four feet high, through which was pierced a tier of nine roomy ports on each side, the sills of which were not more than five inches from the deck. The ports being constructed thus low, by leaving several open, they admitted free vent to any occasional sea that might be shipped, which otherwise would have filled the deck, and, by its weight, have endangered the vessel. To suit this low port the inventor had in mind a light and simple non-recoiling gun-carriage, which was easy to be worked, and

at the same time would have taken up only a small portion of the deck; but instead of this, when it became necessary to complete the Transit for resistance, guns were purchased for the vessel with carriages far too heavy,—which occupied too much of the deck – and which in no way suited the original ports. The bulwark of the vessel was, therefore, cut in pieces, fore-and-aft, for the sake of raising the ports, to make them suit their gun-carriages. This ill-contrived plan has introduced the very evil which the inventor had studiously contrived to avoid; for if, at this time, a large sea be shipped, many tons of water will remain on the deck a considerable while, before the scuppers can give it vent; neverthless, if the Transit be *properly* loaded, with light extremities, and with a draft not exceeding eleven feet, she will ship very little water, even in the hardest weather.

☞ *Vide* "Gower's Seamanship," *for an account of several of his inventions, viz... A Naval Telegraph, Shape Signals, and a mode whereby to regulate the distances of Ships, when in the order of battle, or sailing... A mode of dropping a Guess-wharp Anchor with such accuracy, that the end of the Guess-wharp may be brought to the Vessel with certainty... A double-barrelled Capstern, so contrived, that the barrels may be moved either together or separate—thus, at the time of heaving in the cable, did it become necessary to heave in a wharp, the upper-barrel may be made use of for that purpose, without deranging the messenger, or cable, which is about the lower barrel... A mode of fidding a top-gallant-mast, whereby the fid may be knocked out, by merely setting taught the top-rope..also several contrivances for the better nipping and stoppering a cable, &c. &c.*

THE END.

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